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**Social capital, knowledge sharing and innovation : the role of business group affiliation in Turkey**

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**SOCIAL CAPITAL, KNOWLEDGE SHARING AND INNOVATION: THE  
ROLE OF BUSINESS GROUP AFFILIATION IN TURKEY**

**Ozlem Ozen**

**A thesis submitted for the degree of Doctor of Philosophy**

**University of Bath**

**School of Management**

**June 2017**

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## **List of Abbreviations**

### **Abbreviation**

AVE = Average Variance Extracted

BG = Business Group

CD = Coefficient of Determination

CFA = Confirmatory Factor Analysis

CFI = Comparative Fit Index

CMV = Common Method Variance

CR = Composite Reliability

CSR = Corporate Social Responsibility

ICI = Istanbul Chamber of Industry

ISIC = International Standard Industrial Classification

KS = Knowledge Sharing

MNC = Multinational Corporation

MV = Marker Variable

OLS = Ordinary Least Squares

PCF = Principal Component Factor

RBV = Resource Based View

RESET = Regression Specification Error Test

R&D = Research and Development

RMSEA = Root Mean Square Error of Approximation

ROA = Return on Assets

ROI = Return on Investment

ROS = Return on Sales

SEM = Structural Equation Modelling

SC = Social Capital

SRMR = Standardised Root Mean Residual

2SLS = Two Stage Least Squares

VIF = Variance Inflation Factor

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## **Abstract**

This thesis investigates the relationships between interfirm social capital, knowledge sharing and innovation in the context of business groups in an emerging economy, namely, Turkey. It is contended that these relationships are contingent on the context in which firms operate (Inkpen and Tsang 2005; Moran 2005). In this thesis, business groups, being a dominant form of organisation in emerging economies, is considered as the relevant context. Firstly, taking into consideration business group affiliation, the facilitating role of structural, relational and cognitive social capital regarding knowledge sharing is explored. Secondly, focusing on explorative and exploitative types of knowledge, the impacts of these two types of knowledge sharing on innovation along with the moderation effect of business group affiliation are examined. Moreover, in order to provide insights into the overall theme of the research, group affiliates' knowledge sharing and social capital relations within and outside their boundaries are investigated. Consequently, this study contributes to the existing literature through integrating previous research and the business group context.

The conceptual arguments are tested with a quantitative methodology using unique survey data obtained from 128 Turkish firms listed in Istanbul Chamber of Industry top and second 500 industrial enterprises yearbooks. The empirical findings indicate that firms generally utilize social capital in relation to knowledge exchanges, but its impact varies by group affiliation. In addition, firms benefit from knowledge sharing in terms of innovation. However, knowledge sharing has a stronger influence on innovation for independent firms than for affiliated ones. Moreover, the examination of a subset of business group firms reveals that affiliated firms engage in knowledge sharing and social capital with their sister affiliates more than they do with firms outside the group. The overall results suggest that business group affiliation has a moderating effect on social capital, knowledge sharing and innovation relationships.

## **Chapter 1 Introduction**

### **1.1 Introduction**

Knowledge is one of the most important resources of a firm in relation to competitive advantage and firms increase their innovation performance through integrating knowledge (Grant 1996a; Nonaka et al. 2000). While firms can create knowledge within their boundaries, they also collaborate with other firms to generate novel knowledge. However, firms' own knowledge creation activities may not be adequate for developing product and process innovations. Consequently, a firm enhances its knowledge base through knowledge sharing between firms in order to improve innovation performance (Easterby-Smith et al. 2008; van Wijk et al. 2008). Moreover, knowledge is a scarce resource in emerging economies and firms in these environments may be dependent on other firms for increasing their knowledge base so as to be able to compete with rivals in their environments. Specifically, knowledge exchanges with other firms, such as suppliers, buyers, customers, competitors, universities and other institutions lead to improved innovation performance (Su et al. 2009). In sum, these cooperative relationships of a firm can be the source of its competitive strength (Jarillo 1988).

Firms need to transfer and acquire knowledge for their own success and adaptation to changing environmental requirements. Therefore, knowledge sharing relations emerge as an important point in strategy research. However, this interest in knowledge transfer raises a concern in relation to the facilitating factors in this process (van Wijk et al. 2008; Yli-Renko et al. 2001; Levin and Cross 2004; Li 2005). In this regard, social capital is addressed as an important factor in knowledge sharing process (Inkpen and Tsang 2005). It is defined as a valuable resource that facilitates knowledge and resource sharing between firms (Arregle et al. 2007), which is obtained from the network of social relations (Maurer et al. 2011).

Firms with a high level of social capital are more likely to exchange resources with other firms and perform better. The literature is well documented in terms of the performance consequences of social capital (Luo and Chen 1997; Peng and Luo 2000; Park and Luo 2001; Luo 2003; Wu and Choi 2004; Wu and Leung 2005; Acquaah

2007; Li et al. 2008a). In addition, how social capital affects knowledge exchange relations has received considerable attention in different contexts, including alliances (Walter et al. 2007; Becerra et al. 2008), multinational firms (Hansen 1999; Tortoriello et al. 2012; Noorderhaven and Harzing 2009; Li 2005; Reiche 2012) and independent firms (Yli-Renko et al. 2001; Szulanski et al. 2004). However, the harm as well as benefits of social capital also emphasised in the literature (Adler and Kwon 2002) and hence, it is suggested that the examination of the knowledge sharing benefits of social capital should consider the contingent value of social capital (Moran 2005). This raises the matter of the social context in which firms are embedded (Inkpen and Tsang 2005).

In emerging economies, business groups exercise a strong influence on economic development (Chang and Choi 1988; Chang and Hong 2000) and they are defined as a collection of legally independent firms, which operate under common control (Khanna and Rivkin 2001; Leff 1978). Whilst member firms in a business group are legally independent, they are interdependent with each other within the group (Yiu et al. 2007). Business groups are conceived as a network form of organisation (Cuervo-Cazurra 2006; Granovetter 1995), where affiliated firms are connected each other through formal and informal ties (Goto 1982; Strachan 1976; Khanna and Rivkin 2006). Being affiliated to a business group is deemed advantageous for member firms in inefficient markets of emerging economies, because the group structure facilitates resource and knowledge transfers among member firms. In addition, affiliated firms not only engage in knowledge sharing relations with group member firms, for they also have exchange relations with their business partners outside their boundaries.

Social capital is acknowledged as an important way of doing business in emerging economies. In fact, business groups dominate the activity in these contexts. The advantage that a group provides its firms may be less available to independent firms, however, this should not lead to the misunderstanding that independent firms are closed entities. All firms have relationships with their business partners, such as buyers, suppliers, competitors or other institutions. However, social structure and solidarity among affiliated firms are the distinctive characteristics of these groups (Granovetter 1995). Hence, knowledge flows in groups may be facilitated by the social relations that group members have among each other. Also, group recognition allows

affiliates to interact easily with firms outside their boundaries (Keister 1998; Hsieh et al. 2010; Smangs 2006). From these arguments, it can be inferred that the social capital of groups may confer more advantages on their member firms, particularly by having a facilitating role in knowledge sharing activities among affiliates.

Most social network research remains uncertain with respect to the content that flows through network ties (Hansen 1999), such as ‘knowledge’. As Stinchcombe (1990, p.381) points out: “*We need to know what flows across the links, who decides on those flows in the light of what interests, and what collective or corporate action flows from the organization of links, in order to make sense of inter-corporate relations.*” Consequently, for this study, ‘knowledge’ is taken into consideration as one of the most valuable resources in firms’ success and how the different dimensions of social capital, namely, structural, relational and cognitive, affect knowledge sharing is examined (Nahapiet and Ghoshal 1998; Inkpen and Tsang 2005). Also, despite the abundant research on the relations between social capital and knowledge exchange, relatively less study has considered the particular context of business groups (Yiu et al. 2003; Luo and Chung 2005). Since groups are acknowledged as having strong social capital, its effect on affiliated firms’ knowledge sharing patterns may differ from that of independent firms. Accordingly, when all firms operate in an emerging economy context, the examination of how social capital affects knowledge sharing behaviour of firms and how business group affiliation moderates social capital and knowledge sharing relations, is one of the areas of interest in this study.

Firms’ knowledge sharing activities include utilisation of existing knowledge and creation of new knowledge with external partners. These two types of knowledge flows refer to the exploitation and exploration of knowledge, which are defined as the different modes of organisational learning (March 1991). That is, explorative and exploitative knowledge exchange are defined as creating new knowledge and developing existing knowledge, respectively, from the perspective of interfirm knowledge flows. Both types of knowledge sharing enhance existing innovations and allow for the development of new products or processes (Garcia et al. 2003; Faems et al. 2005). In the literature, exploration and exploitation of knowledge in terms of innovation and performance consequences are examined in different settings, such as alliances (Rothaermel 2001a; 2001b; Yamakawa et al. 2011; Yang et al. 2011; Yang

et al. 2014a), interorganisational collaborations (Im and Rai 2008; Faems et al. 2005), joint ventures (Zhan and Chen 2013), business groups (Lee et al. 2010), clusters (Ozer and Zhang 2015) and independent firms (Chiang and Hung 2010; Kim and Atuahene-Gima 2010; Su et al. 2011; Wang and Li 2008; Wu and Shanley 2009; Yalcinkaya et al. 2007; Atuahene-Gima 2005; Sidhu et al. 2007). Most of these studies have been mainly conducted in developed economies and consequently, little is known about whether and if so, how, this impact varies in emerging economy firms.

It is argued that explorative and exploitative knowledge sharing may have different impacts on innovation in different organisational settings (Coombs et al. 2009; Gupta et al. 2006). In particular, the context in which firms operate may have a moderating impact on the relationships between knowledge sharing and innovation (Zhan and Chen 2013; Su et al. 2011). Several studies have examined various moderators as explaining exploration and exploitation of knowledge, such as formal and relational governance (Yang et al. 2014a), internal autonomy and organisational culture distance (Zhan and Chen 2013), internal exploration and exploitation experience (Hoang and Rothaermel 2010), interfunctional coordination (Atuahene-Gima 2005), existing knowledge stock (Wu and Shanley 2009) and organisational structure (Su et al. 2011; Zhan and Chen 2013). These studies provide insights into how organisational mechanisms enhance or inhibit the impact of explorative and exploitative knowledge on firm performance as well as innovation. Related to this literature, in emerging economies, one of the important contextual factors that may have an impact on knowledge sharing relations is the business group, which is considered as a network form of organisation.

Sharing knowledge is difficult because of its sticky and tacit nature (Szulanski 1996). Business groups with their strong relations within the group, facilitate knowledge exchanges among affiliated firms and with firms outside their boundaries, thanks to their reputational advantages (Chang et al. 2006; Mahmood et al. 2011). Affiliates' organisational context may be more advantageous in terms of allowing effective explorative and exploitative knowledge exchanges than independent firms, thereby promoting their innovation activities. Accordingly, this study considers the impact of business groups in relation to exploring knowledge exchange and innovation relationship. Several studies have examined the knowledge sharing and performance



relations in business groups and made comparison of affiliate firm behaviour with other firms (Lee et al. 2010; Lee and McMillan 2008; Lee et al. 2016). However, how sharing knowledge with business partners affects firm innovation and how this impact differs by group affiliation need further investigation. Accordingly, in this study, the effect of explorative and exploitative knowledge sharing on innovation is examined in terms of the moderation impact of business group affiliation in this relationship. In doing so, this research is also aimed at revealing whether or not firms in emerging economies benefit from explorative and exploitative knowledge sharing and whether the effects of knowledge sharing differ in the business group context.

Business group affiliates not only engage in knowledge sharing relations with group member firms, but also have exchange relations with their partners outside their boundaries. These relations raise two different settings for affiliated firms, such as within and outside group. As a consequence, their knowledge sharing and social capital patterns may differ when they engage in business within and outside the group. However, whilst the business group literature is rich in investigating the performance impacts of affiliation (Khanna and Palepu 2000a; 2000b; Khanna and Rivkin 2001), this distinction has not been addressed. Hence, in addition to the main aims, for this study, group affiliates' relations within and outside the group are examined in terms of tacit and explicit knowledge sharing and social capital along with headquarters-affiliate knowledge flows and affiliate autonomy in decision making.

In this thesis social capital and knowledge sharing strategies of firms are examined. The first one relates to the effect of social capital on knowledge sharing and the other one is the impact of explorative and exploitative knowledge sharing on innovation. In this examination, particularly the moderating impact of business group affiliation is considered. Understanding the role that social capital plays in knowledge sharing and the effects of knowledge sharing on innovation in business group context will enable owners and managers of groups to get a better understanding of the consequences of social capital relations and knowledge strategies they pursue and whether group affiliates create a value different than independent firms do. Accordingly, this study will enable them to create policies and strategies about fostering innovation for their groups based on the outcomes of their knowledge sharing and social capital relations. Also, it will help group managers see whether they share

knowledge within group boundaries more than they do outside their groups, thus, they will be able to decide whether they should create knowledge within or outside their groups. More importantly, this study will also help independent firm managers understand their abilities to compete with group's resource utilisation in the form of knowledge and innovation.

If group firms benefit from social capital, knowledge sharing and innovate better, group managers will recognise the contribution of their knowledge strategies and innovation to the development of their groups, therefore, they may strengthen groups' existence through improvements within and outside the group. If affiliates benefit less from social capital and knowledge sharing, managers may have to restructure their relations within and outside their boundaries, therefore, this examination will help managers see whether these strategies that groups pursue make different impact than the firms outside their boundaries do. In addition, it will enable them make decisions about future of their firms depending on the possible outcomes of these strategies.

The examination of social capital, knowledge sharing and innovation will also help policy makers determine whether or how groups should be supported for the development of economy. Groups' are persistent despite the development in markets and institutional environments in emerging economies. Understanding the role of social capital in knowledge exchanges will help them see whether groups utilise their relations within and outside their boundaries effectively, accordingly, whether the group structure and formation should be supported. In addition, given the importance of innovation and knowledge sharing in the global competitive process, understanding whether groups contribute to these economies through knowledge exchanges and innovation will inform policy makers about the possible outcomes of knowledge creation. Also, they will be able to understand whether firms contribute to innovation activities in general, the role of business groups in innovation and develop policies about groups' future. Consequently, this thesis is aimed at providing an understanding to policy makers about firms' social capital, knowledge sharing and innovation impact along with business groups' role in these strategies.

This thesis addresses these gaps in the literature by investigating the social capital, knowledge sharing and innovation relations of firms in relation to a prevalent type of organisation, i.e. business group context in an emerging economy, namely, Turkey. In this regard, before examining the mentioned relations in detail, a comparison is made between affiliated and independent firms in terms of performance and innovation. Then, employing a subset of Turkish business group affiliated firms, knowledge sharing and social capital relations within and outside the group boundaries are probed. After this introduction, the facilitating role of social capital in knowledge sharing and subsequently, knowledge exchange impact on innovation are examined along with the moderation impact of business group affiliation on these relationships.

## **1.2 Research Aim and Questions**

The overarching aim of this study is to explore social capital, knowledge sharing and innovation relations in the context of business groups in an emerging economy. The literature is established on social capital impact on knowledge flows (Payne et al. 2010), as well as that of knowledge exchange and innovation relations (van Wijk et al. 2008; Phelps et al. 2012). However, this research aims to advance the existing literature by examining these relations in the particular context of business groups. In relation to the overall theme of this thesis, one of the aims is to reveal how knowledge sharing is facilitated by social capital and to address the role of business group affiliation in this relationship. In line with this aim, the literature on the structural, relational as well as the cognitive dimensions of social capital and knowledge exchanges in relation to business groups is reviewed. The second aim of this thesis is to understand how knowledge sharing affects innovation and how this impact is moderated by business group affiliation. In exploring these relations, the current study draws on the existing literature, which includes the examination of explorative, exploitative knowledge exchanges and innovation relations along with the group affiliation. In addition to these main aims, this study is also aimed at whether affiliated and independent firms differ in terms performance and innovation and whether business group affiliated firms' relations with sister affiliates within the group and with other firms outside group differ with regards to knowledge sharing and social capital by employing a subset of group affiliated firms. Based on these research purposes, this study addresses the following research questions:

1. What is the role of social capital in knowledge sharing and how does this effect differ across affiliated and independent firms?
2. What is the effect of knowledge exchanges between firms on innovation and how does business group affiliation moderate this relationship?
3. How do business group affiliated and independent firms differ in terms of performance and innovation? Related to this question, how do group affiliated firms' knowledge sharing and social capital relations differ across within and outside the group boundaries?

### **1.3 Research Contribution**

This study advances the literature on social capital, knowledge exchanges and business groups by making several contributions. The main contribution of this study lies in the understanding of how group affiliation moderates social capital and knowledge exchange relations and how the business group context affects firms' knowledge sharing in terms of innovation performance. In emerging economies, business groups are characterised by their collaboratively coordinated set of 'legally independent' firms (Colpan and Hikino 2010). This characterisation raises two fundamental features of affiliated firms regarding knowledge exchanges and social capital among themselves (Chang et al. 2006; Mahmood et al. 2011; Lamin 2013; Granovetter 2005b; Yiu et al. 2007) along with affiliates' relations outside the group network (Boyd and Hoskisson 2010). There is the possibility that different types of organisational settings depict different relations among social capital dimensions, knowledge flows and performance outcomes in firms (Inkpen and Tsang 2005; Maurer et al. 2011). Consequently, in this study, business groups, being a dominant form of organisation in emerging economies, is considered as the relevant context.

Firstly, this study addresses social capital as a facilitator of knowledge exchanges among firms and is argued that whilst social capital is a way of maintaining relationships in emerging economies (Peng and Luo 2000; Park and Luo 2001), its impact on knowledge sharing may be contingent on the settings in which firms operate. This examination helps to reveal the importance of the context and the contingent value of the structural, relational and cognitive dimensions of social capital (Moran 2005; Li 2005). Since groups are acknowledged as having a strong social capital (Yiu

et al. 2003; Luo and Chung 2005), its effect on affiliated firms' knowledge sharing patterns may differ from that of independent firms. Consequently, this study contributes to the extant literature on social capital and knowledge flows (Li 2005; Yli-Renko et al. 2001; Maurer et al. 2011; Wu 2008) by considering the affiliation impact on the relationship between different dimensions of such capital and knowledge sharing.

Secondly, this study focuses on knowledge sharing and innovation relations and elaborates upon the impact that business group affiliation has on this relationship. Examining knowledge exchanges in the context of group affiliation is an important step in understanding the group impact (Lamin 2013), because knowledge is a salient source of innovation for all firms. Moreover, examining the impact of business group affiliation will help to determine whether or not firms under the umbrella of a group contribute to knowledge exchanges in terms of innovation more than their peers do outside the group. Similar studies have focused on knowledge exchange relations only among affiliated firms (Lee et al. 2010; Lee and MacMillan 2008), however, including a sample of independent firms allows for comparison of affiliate firm behaviour with that of independent firms.

It is argued that the resource based view should consider the contexts in which various kinds of resources have the best influence on performance (Miller and Shamsie 1996; Priem and Butler 2001). Regarding which, organisational context is one of the main contingencies that may moderate the impact of explorative and exploitative knowledge on innovation (Meyer 2007; Whetten 1989; Zhan and Chen 2013; Su et al. 2011). Also, the examination of these knowledge types in the context of intra and interfirm networks is suggested since these knowledge exchange strategies may have different effects on innovation in different settings (Gupta et al. 2006; Coombs et al. 2009). Business group affiliates have advantages over independent firms in creating and application of explorative and exploitative knowledge for innovation activities with other affiliates and with firms outside the group. Hence, this study contributes to business group, knowledge and innovation literatures by investigating the impact of explorative and exploitative knowledge flows on innovation in the context of business groups.

Thirdly, this study contributes to the literature on business groups through scrutinising group firms' relations within and outside their boundaries. As reviewed in this thesis, affiliated firms benefit from knowledge sharing and social capital relations, however, it is not much known whether affiliates have knowledge exchange and social capital relations with sister affiliates more than they do with firms outside the group. That is, this examination is aimed at filling an important gap in the business group literature, by contributing to the understanding of how affiliation to a business group creates value for firms.

In addition to contributing to the business group literature, this study is aimed at adding to the knowledge and innovation literatures by examining explorative and exploitative knowledge flows in the context of an emerging economy. For, research on such knowledge generally focuses on developed economies (Su et al. 2011). Since knowledge is a scarce resource in emerging economies, advantages that firms create through knowledge exchanges for their innovation activities may differ from developed economy firms' behaviour. Consequently, this study advances the literature by focusing on knowledge flows in an emerging economy context.

#### **1.4 Structure of the Thesis**

The rest of this thesis is organised as follows. In chapter two, a literature review about the research concepts of social capital, knowledge sharing and business group affiliation is presented. This chapter draws on social capital, knowledge and business group literatures and examines the relationships between social capital, knowledge sharing and innovation in the broader context of business group affiliation. In this chapter, first, the impact of social capital on knowledge sharing is reviewed along with an introduction to its structural, relational and cognitive dimensions as well as the moderating role of group affiliation being addressed. Secondly, the knowledge sharing impact on innovation is discussed along with an introduction to explorative and exploitative knowledge sharing. Then, the role of business group affiliation in this relationship is considered. The empirical examination of all these relations is provided in subsequent chapters. In chapter three, the research methodology is introduced, which includes the research context, explanation of the sample and data collection

along with an introduction to the variables used in empirical chapters and measurement model assessment.

Chapter four utilises literature on business groups and provides an introduction to the characteristics of Turkish business groups along with an explanation of the performance impact of group affiliation. Then, focusing on a subset of group affiliated firms, this chapter continues with an empirical examination of affiliated firms' social capital relations, tacit and explicit knowledge sharing within and outside group boundaries along with knowledge flows from the holding company and affiliated firm autonomy in relation to the overall research concepts that are further investigated in chapters five and six. This chapter also includes an empirical comparison of affiliated and independent firms in terms of performance and innovation. In chapter five, social capital, knowledge exchange and business group literatures are used and an empirical examination is provided about the effect of structural, relational and cognitive social capital on knowledge sharing, with consideration of the moderating impact of business group affiliation. The sixth chapter draws on knowledge, innovation and business group literatures and empirically examines knowledge sharing and innovation relations within the framework of business group concept. In this chapter, after detailed investigation of the effects of explorative and exploitative knowledge sharing on innovation, the moderating impact of business group affiliation on these relations is evaluated. In chapter seven, the last, the overall results of the empirical chapters are summarised and the contributions of the research are outlined along with the implications for business and policy. The final chapter concludes with limitations of the study and suggestions for future research.

## **Chapter 2 Literature Review**

### **2.1 Introduction**

This chapter provides a literature review about the research concepts of social capital, knowledge sharing and business group affiliation, used in this thesis. The second section evaluates the effect of social capital on knowledge sharing, with an introduction to the structural, relational, cognitive social capital dimensions. The third section, introduces business groups and explains how business groups create social capital for their affiliated firms. The fourth section introduces knowledge and its role in innovation. The fifth section examines how knowledge sharing affects innovation along with a brief introduction to the explorative and exploitative knowledge distinction. In addition, it explains group affiliation's relations to both knowledge sharing and innovation. The sixth section concludes this chapter.

### **2.2 Antecedents of Knowledge Sharing and Social Capital**

Firms gain competitive advantage by building cooperative networks with other firms, because these linkages provide them with resource flows (Gulati et al. 2000). Despite the resource based view explaining the value creating effect of the resources within the firm, the sharing them and the transferability of the benefits related to these resources need a further theoretical framework to explain the relationship between network resources and (Gulati 1999) and firm performance (Lavie 2006). A combination of the resource based view with social network theory allows us to understand how firms' behaviour are shaped by the relations they form within their environments and how their social networks with external knowledge sources affect innovativeness (Lee et al. 2001; Zaheer and Bell 2005; Lavie 2006).

The cooperative relationships of a firm can be the source of its competitive strength (Jarillo 1988). Whilst firms pursue autonomous strategies, their interfirm relations represent mutual activities (Cropper et al. 2008). Firms can leverage interfirm relationships to share resources with each other and gain competitive advantage over firms that do not have similar behaviour. From these resources, the environment in emerging economies renders knowledge a source of organisational advantage for



firms, as the performance of firms becomes more dependent on that knowledge (Phelps et al. 2012). Firms need to transfer and acquire knowledge for their own success and adaptation to changing environmental requirements. Consequently, knowledge sharing relations emerge as an important concern in strategy research, which raises the question as to what are the facilitating factors in this process (Yli-Renko et al. 2001; Levin and Cross 2004; Li 2005).

Research on knowledge sharing defines a range of antecedents of transfer among firms from knowledge characteristics to organisational characteristics and social mechanisms (Michailova and Mustaffa 2012). Gupta and Govindarajan (2000), focusing on subsidiaries of multinational companies in the U.S., Japan and Europe, find that transmission channels, motivational disposition to acquire knowledge and absorptive capacity influence the procedural type of knowledge (product designs, distribution know how etc.) inflows from other subsidiaries. Knowledge outflows to peer subsidiaries are affected by the formal integrative and lateral socialisation mechanisms. Tsai (2002), drawing on a social network perspective, investigates the effectiveness of formal hierarchical structure and informal lateral relations on knowledge sharing in intraorganisational networks that consist of both collaborative and competitive ties among organisational units in a multi-unit company. According to the results, a formal hierarchical structure, in the form of centralisation, has a significant negative effect on knowledge sharing, whereas, informal lateral relations, in the form of social interaction, have a significant positive effect on such sharing among units that compete with each other for market share, but not among units that compete with each other for internal resources. The authors contend that organisational units gain more opportunities to share their resources or ideas and thus, increase knowledge flows through social interactions. Hansen (1999) suggests that weak interunit ties help a project team in a multiunit electronics company to search for useful knowledge in other subunits, but impede the transfer of complex knowledge, which tends to require a strong tie between the two parties to a transfer. Schulz (2003) analyses the determinants of horizontal inflows of knowledge from peers and the vertical inflow of knowledge from supervising units into subunits of U.S. and Danish multinational corporations. The results show that subunits with specialised knowledge bases receive less knowledge from their peers; an extended extra-unit knowledge base

does not increase direct inflows of knowledge from peer subunits, whereas, informal relations with peers do so.

Transferring knowledge is difficult due to its non-codified and tacit nature (Kogut and Zander 1992; Szulanski 1996). Applying this to interfirm knowledge sharing relations, it can be asserted that knowledge sharing among firms is more difficult than sharing knowledge within an organisation (van Wijk et al. 2008). In this sense, it is argued that social structure, in the form of social networks, affects economic outcomes because social networks affect the flow and the quality of information (Granovetter 2005a). Therefore, social capital may enable firms to tap into the knowledge of partner firms by creating the necessary conditions, such as establishment of managerial ties, trust and interaction for effective knowledge sharing (Yli-Renko et al. 2001; Inkpen and Tsang 2005). Interfirm relations provide firms with knowledge transfers and social capital is the means for these transfers, for without some degree of it, firms may be reluctant to share their own knowledge (Hughes et al. 2014). In particular, social capital is acknowledged as an important way of doing business in emerging economies, where, as aforementioned, firms operate in an environment with weak institutional support (Peng and Luo 2000; Luo et al. 2011). For instance, ties in China (guanxi) are a form of social capital that constitute a way of bridging firms so as to facilitate resource flows (Park and Luo 2001; Tsang 1998; Luo and Chen 1997).

Given knowledge sharing process is difficult to establish, firms' social connections can play an important role regarding this interaction. Consequently, social capital as an antecedent and facilitating factor (Nahapiet and Ghoshal 1998) can enable firms to tap into the knowledge of their business partners (Coleman 1990). Moreover, when all firms operate in the same emerging economy, social capital could demonstrate different impacts in various contexts, such as business group affiliates and independent firms. Accordingly, the next parts of the literature review examine the effect of social capital relations on knowledge sharing and the conditioning role of business group affiliation in these relations.

### 2.2.1 Social Capital and Knowledge Sharing

The embeddedness argument stresses the role of personal relations and networks of relations in generating trust (Granovetter 1985) driven by the perception that *“economic action and outcomes are affected by the structure of the overall network of relations”* (Granovetter 1992, p.33). Granovetter defines two types of embeddedness, namely, the relational and structural aspects. Structural embeddedness, which pertains to considering the properties of the social system and network of relations, describes the impersonal configuration of linkages between people or units. It covers the presence or absence of network ties between actors and the features of the linkages, such as the density, connectivity and hierarchy. On the other hand, relational embeddedness refers to the relations people have aimed at facilitating the leveraging of assets (Nahapiet and Ghoshal 1998). It involves focusing on the role of close ties in gaining information (Andersson et al. 2002) and includes interpersonal trust, trustworthiness, feelings of closeness and interpersonal solidarity (Moran 2005). While relational embeddedness has direct effects on individual economic action, structural embeddedness has fewer such effects (Granovetter 1992).

According to Coleman (1988), Granovetter’s idea of embeddedness gives rise to the notion of social organisation and the concept of social capital can be used in this regard in the analysis of social systems. Adler and Kwon (2002, p.17) define it as the *“goodwill that is engendered by the fabric of social relations and that can be mobilized to facilitate action”*. Social capital includes some aspects of social structures that facilitate certain behaviours of the actors within the structure (Coleman 1988) and it is regarded as an asset obtained from social relations (Edelman et al. 2004; Maurer et al. 2011). Firms invest in a network of relations to increase their social capital so as to facilitate access to information (Adler and Kwon 2002). Social capital involves resources embedded in a social structure and the use of such resources for managing interfirm relationships (Lin 1999; Walker et al. 1997). Many firms cannot control the resources that they need to compete effectively in the market and therefore, they need to get access to necessary resources from external sources. Social capital, as a valuable asset, aids firms by increasing the leverage of resources, such as information, technology and knowledge (Arregle et al. 2007). Moreover, it is asserted that social

capital is “*more than mere social relations and networks; it evokes the resources embedded and accessed*” (Lin 1999, p.37).

Nahapiet and Ghoshal (1998) identify three dimensions of social capital as structural, relational and cognitive. In order to describe the structural and relational dimensions, the authors rely on Granovetter’s (1992) relational and structural embeddedness conceptualisation. The structural dimension of social capital relates to the properties of the social system and network of relations, which include social interaction. For instance, a firm’s location in a social structure of interactions provides it with access to resources (Tsai and Ghoshal 1998). The relational dimension of social capital includes assets that are rooted in these relationships, such as trust, trustworthiness, obligations and expectations, norms and sanctions, identity and identification (Tsai and Ghoshal 1998; Nahapiet and Ghoshal 1998). The cognitive dimension refers to the resources providing shared representations, interpretations and systems of meaning among parties (Nahapiet and Ghoshal 1998).

Social capital has positive effects on firm performance and innovation, for firms with a high level of it are more likely to exchange resources with other firms and innovate (Molina-Morales and Martinez-Fernandez 2010; Capaldo 2007; Florin et al. 2003). Subramaniam and Youndt (2005) emphasise the importance of social capital in incremental and radical innovations, arguing that it is an organisational resource that enhances innovation through its facilitating effect on knowledge and information acquisition. Regarding which, Molina-Morales and Martinez-Fernandez (2010) find a positive impact of social interaction, trust and shared vision on the product and process innovations of Spanish firms. Luk et al. (2008) show a positive impact of guanxi with government officials and with managers at other firms on administrative and product innovativeness, respectively. Carmona-Lavado et al. (2010) find a positive relation between social capital and product innovation of Spanish firms. Lawson et al. (2008) find a positive effect of relational and structural social capital on buyer performance of U.K. manufacturing firms. Similarly, Carey et al. (2011) show a positive impact of relational capital on buyer innovation and cost improvement in U.K. based manufacturing firms. Perez-Luno et al. (2011) find a positive impact of external social capital on the innovation of Spanish manufacturing firms. Laursen et al. (2012) show

a positive impact of structural social capital in terms of social interaction on the product innovation of Italian manufacturing firms.

On the other hand, social capital may harm firm performance and innovation. Strong ties between firms may not provide novel information and strong solidarity between them might, in fact, overembed them in that relationship, which prevents them from obtaining new ideas and knowledge (Adler and Kwon 2002). That is, social interaction with existing firms may hinder the generation of new capabilities in changing environments, whereby a high level of trust may thwart their searching for diverse external resources (Molina-Morales and Martinez-Fernandez 2009). Regarding, Villena et al. (2011), examining social capital and performance relations in Spanish firms, show an inverted curvilinear relationship between relational, structural social capital and firm performance. Molina-Morales and Martinez-Fernandez (2009) find a curvilinear relationship between trust and innovation of Spanish clustered firms.

Despite these mixed impacts on firm innovation and performance, access to external knowledge is facilitated by social capital (Anand et al. 2002). Structural social capital, in the form of strong ties and frequent interactions, allows firms to transfer knowledge more, which is beneficial for the innovation process (Capaldo 2007; Villena et al. 2011). In this respect, Walter et al. (2007) emphasise two relations that multinational firms have within their environment. One of them is the interfirm network, which is defined as the relations that business units of multinationals have with independent firms in the form of strategic alliances, whilst the other is the intrafirm network, which is defined as the relations that business units have with other units within the same multinational corporation in the form of formal and informal links. Structural social capital with dense ties in interfirm networks with alliance partners provides firms with knowledge transfers, however, these networks may also deliver redundant information. Consequently, firms benefit from spanning structural holes and connecting with previously unconnected partners (with non-redundant ties), which can provide them novel knowledge. On the other hand, in case of intrafirm networks within the multinational corporation, dense ones foster knowledge exchange, however, structural holes or sparse networks can hinder efficient knowledge exchanges. Relational social capital facilitates learning, which includes the acquisition

of information and know-how between alliance partners (Kale et al. 2000), because knowledge transfers are more effective when firms develop trust based relations with other firms (Hughes et al. 2014). Similarly, cognitive social capital provides firms with a shared vision, which enables common understanding of collective goals and resource exchange (Molina-Morales and Martinez-Fernandez 2010; Villena et al. 2011).

Interfirm knowledge sharing and social capital relations in different contexts are examined in the literature. In their theoretical study, Inkpen and Tsang (2005) examine how the social capital dimensions of networks affect the transfer of knowledge between network members, with the authors define three network types: intracorporate networks, strategic alliances and industrial districts. Using a social capital framework, they identify structural, cognitive and relational dimensions, arguing that each network type has different social capital dimensions in terms of knowledge transfer behaviour. Firms should manage their social capital in order to have efficient knowledge transfer.

Social capital is an important asset for multinational firms because of the need for resources, such as knowledge, technology and information in global markets, especially in emerging ones (Hitt et al. 2002). Relational embeddedness in an MNC provides subsidiaries with exchanging information through relationships with customers, suppliers and competitors (Andersson et al. 2002). Regarding which, Tsai and Ghoshal (1998) examine the relationships between the structural, relational and cognitive elements of social capital, resource sharing and product innovation of business units within a multinational electronics company. The structural, relational and cognitive elements of social capital are operationalised through social interaction ties, trustworthiness and shared vision, respectively. The findings reveal that social interaction and trust are related to the extent of interunit resource exchange, which creates value for the firm through a positive significant effect on product innovation.

Drawing on the social capital literature, Li (2005) investigates the effect of trust and shared vision on the inward knowledge transfer to subsidiaries from both the subsidiary's corporate and external relations in Chinese multinationals. The results show no significant finding on the general effect of trust on inward knowledge transfer to the subsidiary when the transfer from headquarters and external relations is not

distinguished. However, the interaction of trust with external relations has a positive significant effect on inward transfer, thus showing that trust is more important in external knowledge sharing relations than in inward ones. Shared vision has a strong positive effect on inward knowledge transfer to the subsidiaries from both headquarters and external relations, whereas, the interaction of such vision and external relations shows a significant negative effect, thus indicating that shared vision with headquarters is more important in knowledge transfer than with external firms. Hence, the outcomes of this study show that trust is a more effective mechanism for inward knowledge transfer to subsidiaries in interorganisational relationships and shared vision, in contrast, is more influential in intraorganisational (headquarter–subsidiary) relationships. Tsai (2000) shows that structural and relational social capital in the form of network centrality and trustworthiness, respectively, are positively related to intangible resource (know-how, technical skills) exchange among units in a multinational company.

Social capital effect on knowledge transfers are examined in relation to independent firms besides multinationals. Yli-Renko et al. (2001), employing a sample of entrepreneurial high technology ventures in the U.K., examine its effects in terms of customer relationships on knowledge acquisition and knowledge exploitation. The structural, relational and cognitive parts of the social capital are operationalised as customer network ties, social interaction and relationship quality, respectively. The results reveal that the social interaction and network ties are associated with greater knowledge acquisition, but the relationship quality has a negative impact. These findings indicate that these dimensions are distinct and have differential effects on knowledge acquisition. Uzzi and Lancaster (2003) investigate how informal interfirm relationships affect different types of knowledge transfer and learning benefits across the firm boundaries of banks in the Chicago area. Drawing on a social embeddedness perspective, they define the quality of informal ties as arm's-length and embedded ties. They elicit that different types of ties support different forms of knowledge transfer and different forms of learning. Specifically, when arm's-length ties connect firms, they tend to transfer public knowledge and stimulate exploitative learning. Whilst when firms are linked via embedded ties, they tend to transfer private knowledge and engage in exploratory learning.

However, research on business group firms is sparse. In one of the rare works, Yiu et al. (2003) examine the effect of business group affiliates' relational and cognitive social capital on the corporate entrepreneurial intensity of affiliated firms in the context of Chinese business groups and find a significant effect of social capital on firms' entrepreneurial intensity. Despite the social capital effects on knowledge sharing and firm performance having been examined in different contexts, whether group affiliation moderates the relationship between social capital and knowledge sharing remains underexplored. The next part of the review addresses this gap in the literature by introducing business groups and examining the role of business group affiliation in social capital and knowledge sharing relations.

### **2.3 Business Groups**

Business groups are the dominant form of organisation in emerging economies (Leff 1978; Yiu et al. 2005; Mahmood et al. 2011). They are called zaibatsi and keiretsu in Japan, chaebol in Korea, qiye jituan in China, business houses in India, jituanqiye in Taiwan and family holdings in Turkey (Granovetter 1995; Yiu et al. 2007; Chung 2006). Business groups have emerged in response to underdeveloped institutions in emerging economies so as to generate their own internal capital, labour and product markets (Leff 1978; Khanna and Palepu 1997; Khanna and Palepu 2000a; 2000b; Yiu et al. 2005; Yiu et al. 2014; Chittoor et al. 2015). These groups operate in multiple industries, although member firms may not be diversified (Khanna and Yafeh 2007; Vissa et al. 2010).

From the resource based perspective, entrepreneurs create groups through combining foreign and domestic resources. Firms that are able to combine labour, capital, raw materials, knowledge and markets, create a business group by entering different industries (Guillén 2000). Once a business group is formed, they acquire resources and develop market capabilities in order to compete (Yiu et al. 2005). The persistence of groups is related to 'capabilities of recombination' and the growth of the groups in emerging economies is explained by 'capability building among affiliates' (Bugador 2015). Business groups utilise foreign technology to enter new industries and as they acquire new technology, they develop project execution capabilities internally (Amsden and Hikino 1994). This skill then becomes a sharable



resource that enhances the diversification and production capabilities of the group. Group headquarters provide affiliated firms with knowledge in administrative skills, financial support, marketing expertise and human resource management. Intragroup resource allocation and capability deployment within the groups in this way may explain their existence in emerging economies (Colpan and Hikino 2010). Regarding which, Yiu et al. (2005) show that Chinese business groups' internal technological, product and marketing capability development have a positive effect on their performance. Manikandan and Ramachandran (2015), examining Indian firms, reveal that group affiliation has a positive significant effect on firms' growth opportunities.

Business groups are defined as a collection of legally independent firms, which operate under common control with formal and informal ties among member firms (Leff 1978; Granovetter 1995; Khanna and Rivkin 2001; Yiu et al. 2005; Cuervo-Cazurra 2006; Khanna and Yafeh 2007). Various ties that link member firms together and the core entity's (parent company) control and coordination among firms are the two main characteristics that distinguish such groups from other organisational forms (Yiu et al. 2007). Whilst member firms in a business group are legally independent, they are interdependent with each other within the group (Yiu et al. 2007; Chung 2001; Barbero and Puig 2016). The legally independent firms with their own intangible and tangible resources function as operating divisions under the control of the parent company (Chang and Hong 2000). In addition to the relationship between a core firm and its member firms in a business group, the member firms have various types of interfirm relations, such as horizontal connections between individual firms (Hamilton and Biggart 1988; Yiu et al. 2007). The affiliated firms are connected each other through various mechanisms, such as cross-stockholding, interlocking directorates, loan dependence, transaction of intermediate goods and joint subsidiary (Goto 1982). Firms within groups coordinate their activities in order to collaborate with each other (Colpan and Hikino 2010). For instance, buyer-supplier ties, equity ties and interlocks increase the R&D acquisition capabilities of affiliated firms in Taiwanese business groups (Mahmood et al. 2011). However, while group firms have business relations with each other, they have their own governance system, such as shareholders and directors (Mahmood et al. 2011).

Business groups can be conceived of as a network form of organisation, where individual affiliates are connected with each other through both personal and equity ties (Granovetter 1995; Cuervo-Cazurra 2006; Podolny and Page 1998; Chang 2006; Inkpen and Tsang 2005; Vissa et al. 2010; Mahmood et al. 2011; Smangs 2006). Network forms allow firms to learn new skills and acquire knowledge, gain legitimacy, improve economic performance and manage resource dependencies (Podolny and Page 1998). The network ties that connect group affiliates range from formal ties based on crossholdings, interfirm loans, director interlocks, common owners and buyer-supplier agreements to informal ties, such as bonds between investors and social connections pertaining to family, friendship, religion, language and ethnicity (Khanna and Rivkin 2006; Strachan 1976). Whilst firms outside business groups also develop ties, these are different from the close ties that affiliates have among themselves (Keister 2009). For instance, while two group affiliates are connected through ties between buyers-suppliers, equity and directors, two firms in a more general network are more typically linked to each other via a uniplex tie, for example, a joint venture, collaborative agreement or a licencing contract (Mahmood et al. 2011).

Social structure and solidarity among affiliated firms are also distinctive characteristics of the business groups (Granovetter 1995). It is argued that the presence of social relations is one of the characteristics that differentiates them from other organisational settings, such as multinationals (Yiu et al. 2007). In fact, the informal relations between affiliates are considered as important as the formal ones for the functioning of the groups (Smangs 2006). It is further suggested that information flow among group firms may be the result of social relations as well as formal relations, such as debt relations, personnel exchanges, social and political ties (Keister 1998). This informal social network type of organisation provides firms with access to resources, such as the technological and marketing knowledge of other firms within the group (Li and Kozhikode 2011). For instance, Carney et al. (2011) suggest that owing to the social norms across many business groups, affiliated firms approach other affiliates with aim of forging buyer-supplier relationships before having relations with unaffiliated ones.

In addition to the internal relations and advantages, the resource based view can be extended to the external benefits of group affiliation, such as the social and

reputational capital of affiliates that provide firms access to resources outside the group boundaries (Nahapiet and Ghoshal 1998; Boyd and Hoskisson 2010; Becker-Ritterspach and Bruche 2012). That is, member firms are able to interact with firms outside the group to access to external knowledge and resources in order to enhance innovation. This interaction may be achieved more easily when compared to independent firms, because affiliates can use their group reputation and recognition (Hsieh et al. 2010). Also, affiliates form these external relations outside the group in order to obtain R&D capabilities (Mahmood et al. 2011).

### **2.3.1 Business Group Affiliation and Social Capital**

Whilst all firms establish interfirm relations to gain access to knowledge, the interfirm relations that a business group already has established among members generate opportunities for affiliated firms to gain knowledge easier than for independent firms. In this regard, affiliated firms may draw upon the social capital that the business group previously created to enhance their interactions within the group, thereby improving the exchange of knowledge. Moreover, group affiliated firms can rely not just on the internal markets within the group structure, but also on the relationships their affiliate members have with outside firms, such as buyers, suppliers and other organisations. At the same time, other independent firms have social and economic ties in many emerging economies (Khanna and Rivkin 2006). These firms need to develop social interactions in order to share knowledge with their business partners and to gain benefits from this process.

Smangs (2006) emphasises the role of relationships linking firms to one another and states that business groups are best understood as consisting of multiplex ties between units. Furthermore, the author argues that informal links are as important as formal ones in the functioning of business groups and social structure as well as solidarity among component firms are the distinctive characteristics of them (Granovetter 1995). As such, social capital in business groups constitutes an organisational resource that cannot be reduced to that of individuals and this aspect of such groups is one of the reasons to acknowledge them as interfirm entities (Smangs 2006).

Information flow among business group firms may be the result of social capital as well as formal relations, such as debt relations, personnel exchanges and political ties (Keister 1998). Social relationships in business groups provide member firms with information exchange. A firm's embeddedness in a group provides it with access to information based resources. The shared norms and morality embedded in these ties reduce transaction costs and facilitate intragroup transfers of resources (Chang et al. 2006). Embedded relationships have three main components that regulate the expectations and behaviours of exchange partners, including trust, fine-grained information transfer and joint problem-solving arrangements (Uzzi 1997). As business groups are composed of independent firms that operate in multiple industries, these firms develop expertise within their industry that can be transferred and utilised in other areas. Business group affiliation is expected to confer an advantage to group affiliated firms by providing access to skilled employees, training and to complex technological capabilities situated in affiliates, an advantage that is unavailable to unaffiliated firms (Lamin and Dunlap 2011). On the other hand, group firms can rely on the relationships their affiliates have with outside firms, such as suppliers, buyers or other organisations. Affiliates may use social capital that the group has already established to interact with their business partners and this advantage that group creates for member firms may be much less available to independent firms.

Business groups are distinguished from other firm groupings by their social solidarity and social structure. The common social bonds among member firms create a sense of identity which stems from the family domination in governance (Granovetter 1995; Granovetter 2005b) and the social structure enables mutual trust among member firms (Granovetter 1995). Both formal and informal ties that connect group members facilitate knowledge and resource sharing as well as reducing opportunism (Dau et al. 2015). Despite member firms being legally separated, family control through holding companies and pyramids makes this legal independence meaningless (Granovetter 2005b; Piana et al. 2012). Specifically, family ties have benefits, such as providing firms with financial and intellectual resources, lowering transaction costs and contractual disagreements (Khanna and Palepu 2000b; Piana et al. 2012; Lamin and Dunlap 2011). Moreover, affiliates controlled by family members who have close relations with the holding company at the top, are able to acquire more resources for their innovation activities.

Business groups can be the examples of social organisations, where social capital patterns are observed with high levels of interaction and closure among member firms (Yiu et al. 2003). From the structural social capital perspective, one type of ties that links group firms is the interlocking directorates in which group firms have common members on their boards, which help to coordinate group activities (Granovetter 1995). Interlocking directorates are the interfirm means that facilitate the knowledge and information exchanges (Yiu et al. 2007; Dau et al. 2015; Borgatti and Foster 2003). Also, such directorates create trust in strategic exchanges, such as knowledge and enhancing innovation (Mahmood et al. 2011). For instance, keiretsu group affiliates in Japan utilise the interlocking directorates and other linkages to overcome problems related to markets (Kim et al. 2004). Also, the presidents' council in a keiretsu creates a group identity and its members have power in decision making and information sharing (Kim et al. 2004). Social ties between group members allow firms to share their resources and to coordinate their activities (Yiu et al. 2007) and those ties between affiliates increase the knowledge depth that flows among them (Lamin 2013). This social network among members plays an important role in novel knowledge transfers (Argote and Ingram 2000). Having a high centrality within the group network, also, provides member firms with more knowledge and resources (Hsieh et al. 2010). In addition, affiliates are more likely to have business relations with other affiliates than with other firms outside the group (Kim et al. 2004).

In terms of the relational dimension, a trustworthy environment among affiliates provides them with reliable knowledge exchanges without having the concern of finding potential business partners (Lamin 2013) and norms within a group reduce the risk of opportunism (Yiu et al. 2003). Regarding the cognitive dimension, common beliefs that tie the member firms together, facilitate knowledge acquisition, exploitation and innovation (Yiu et al. 2014). Affiliates have shared norms and trust among themselves, which allow for them freely to exchange knowledge without having a fear of opportunism (Lamin and Dunlap 2011). Shared vision and common culture enhance communication, collective goals and exchanges within the group (Yiu et al. 2003). Regarding which, Keister (2009), after examining Chinese groups, argues that social capital in the form of external ties with firms outside the group and internal ties within it, play an important role in the formation of economic ties, such as lending and trade ties and finds a positive impact of interlocks on the performance of the

affiliates. This effect is attributed to the benefits of interlocks in terms of providing knowledge flows among firms and reducing the cost of information.

However, social capital may not be beneficial if affiliates are highly embedded in their existing relations. For instance, Luo and Chung (2005), examining Taiwanese groups, show that during market transition, family and prior social relationships enhance firm performance up to a point. However, after that additional family members can harm firm performance due to possible informational disadvantages. Khanna and Rivkin (2006) argue that social, economic, formal and informal ties in groups play an important role in social construction of the groups, however, these ties are prevalent between independent firms in emerging economies as well. Depending on this argument, the authors examine whether these ties distinguish group boundaries from the independent firms in the Chilean context. The results reveal that while ownership overlaps, indirect equity holdings and director interlocks determine group boundaries, family ties and direct equity holdings do not distinguish between these boundaries. The authors conclude that in emerging economies, if family ties become persistent they cannot distinguish groups from the overall network of social and economic ties.

From this review, it can be inferred that the social capital of groups may confer more advantages to their member firms, particularly by having a facilitating role in knowledge sharing activities among business partners. In particular, social capital is acknowledged as an important way of doing business in emerging economies and groups would appear to dominate the activity in these contexts. The advantage that a group provides its firms may be less available to independent firms, however, this should not lead to the view that independent firms are closed entities. For, all firms have relationships with their business partners, such as buyers, suppliers and competitors. Knowledge is a valuable asset that improves a firm's innovation performance. However, it is not easy to exchange and firms need to construct relationships with their business partners in order to acquire knowledge from outside as well as for sharing their existing knowledge. Moreover, business groups may facilitate knowledge sharing and accordingly innovation by creating an internal market for their affiliated firms. Accordingly, the next parts introduce the role of knowledge

sharing in innovation and examine the role of business group affiliation in knowledge sharing and innovation relations.

## **2.4 Knowledge and Innovation**

The resource based view (RBV) emphasises the role of firm-specific resources that can be defined as tangible and intangible assets (Wernerfelt 1984). Under RBV, it is assumed that firms can create sustained competitive advantage through the resources that are valuable, rare, imperfectly imitable and are not substitutable internally (Barney 1991). Trademarks, intellectual property rights, trade secrets, contracts and licences, information, personal and organisational networks, know-how of employees, reputation of company and culture of the organisation are all examples of intangible sources which in combination can deliver competitive advantage (Hall 1993; Grant 1996a). Since a firm is perceived as a ‘collection of resources’ which determines the growth, these and productive services facilitate innovation through “*combinations of services for the production of new products, new processes for the production of old products*” (Penrose 1959, pp.77, 85, 86). However, RBV focuses on the internal resources of the firm which generate competitive advantage and does not provide enough foundation on how external factors and relations with actors, such as suppliers, buyers or other firms through shared resources affect firm innovation and performance. The RBV needs to consider external environments in which the various resources are most productive (Miller and Shamsie 1996). Considering these factors, RBV is extended to suggesting that firms can access resources that are not controlled by them. Accordingly, external resources, exchanges and cooperative interaction can contribute to firm performance (Lorenzoni and Lipparini 1999; Zander and Zander 2005; Mathews 2003; Lavie 2006). Firms integrate resources externally from suppliers, buyers, research centres, universities and other institutions, which allow them to achieve product and process innovation (Bowman and Ambrosini 2003).

The resource based view has also been extended to address the knowledge based view, whereby it is emphasised that knowledge is the most important resource of a firm, which brings advantage in competition (Barney et al. 2011; Kraaijenbrink et al. 2010; Acedo et al. 2006). This view emanates from RBV, organisational learning, capabilities, innovation and new product development; explains the competitive

advantage of the firms based on the creation and application of knowledge (Grant and Baden-Fuller 1995; Grant 1996a; Conner and Prahalad 1996). In fact, RBV has been applied to knowledge based theories of the firm, innovation and interfirm cooperation (Barney 2001; Grant 1996a; 1996b; Conner and Prahalad 1996; Kogut and Zander 1992).

Based on these theoretical arguments, knowledge is regarded as one of the most strategically important resources of a firm (Grant 1996a), being embedded in its business routines and processes. Firm knowledge can be categorised into ‘know-how’ and ‘information’. Generally, knowledge includes the competence of individuals, insights, interpretations and information (Zander and Kogut 1995; Schulz 2001). It is a critical resource in production and a firm’s role is the integration of knowledge into the production of goods (Grant 1996a; 1996b). Moreover, firm innovations are the outputs of a firm’s capability of applying existing knowledge (Kogut and Zander 1992). Schumpeter (1947, p.151) defines innovation as the “*doing of new things or the doing of things that are already being done in a new way*”. It refers to the process involving the creation and use of knowledge for the development of something new. That is, this process includes new knowledge creation and its transformation into new product and processes (Wallin and von Krogh 2010). Product innovation refers to the development of a new product or improvement of an existing product. Process innovation relates to production process, which includes the introduction of a new method of production, improvement in manufacturing flexibility and/or a reduction in labour costs (De Propris 2002; Leiponen and Helfat 2010; Un and Asakawa 2014). In this sense, knowledge is the source of product and process innovation (Ichijo 2002; Nonaka and von Krogh 2009). Specifically, new product development requires the integration of broad knowledge (Grant 1996b). Knowledge about product, technologies and processes is important in creating new products or services, because this facilitates the development of skills that lead to competitive advantage (Sullivan and Marvel 2011; Meeus et al. 2001).

## **2.5 Knowledge Sharing and Innovation**

Firms are able to learn and innovate new products and processes or improve existing ones through integrating and creating knowledge (Nonaka et al. 2000;



Tsoukas and Mylonopoulos 2004; Smith et al. 2005). Whilst it may be developed within the firm, firms learn from other firms and create knowledge with other actors, such as partners, suppliers, buyers or competitors to enhance their capabilities (Easterby-Smith et al. 2008; Rosenzweig and Mazursky 2014). For, they might not be able to create all knowledge related to innovation internally. Also, firms' own knowledge base may not be adequate for solving complex problems related to product innovations and its continuous use might decrease the marginal utility (Sigurdson 2000; Chatterji and Fabrizio 2014; Caloghirou et al. 2004; Yang et al. 2010; Wu and Wu 2014). In emerging economies, internal knowledge creation and R&D activities are usually low (Wang and Libaers 2016) and when this is so, the knowledge required for innovation lies outside the firm boundaries. As a consequence, such firms search for knowledge externally, combining their knowledge with new knowledge from outside the firm and integrate this into their processes in order to achieve innovation (Sammarrà and Biggiero 2008; Miller et al. 2007; Li-Ying et al. 2014; Zhou and Wu 2010). Moreover, for a firm conducting internal R&D activities, these may well not be sufficient for achieving technological developments and thus, joint R&D activities with other firms can provide them with external knowledge that is beneficial in terms of innovation performance (Berchicci 2013; Husted and Michailova 2010). Further, new knowledge, when combined with internal knowledge, yields more innovative products by increasing the knowledge variety (Wang and Libaers 2016; Cassiman and Veugelers 2006; Love et al. 2014). During this process, firms' external relations and interactions with partners provide knowledge that is necessary for innovation (Chesbrough 2003; Cowan et al. 2007; Howells et al. 2003; Roper et al. 2010).

The empirical research, however, shows mixed results regarding the effect of internal and external knowledge on innovation performance. Foss et al. (2013), examining the external knowledge sources on the opportunity exploitation of Danish firms, find that external knowledge sources are positively related to opportunity exploitation on new products, services, production technology and markets. Love et al. (2014) show that external knowledge sourcing from suppliers, buyers, competitors, joint ventures has a positive impact on the innovation of Irish manufacturing firms. Katila (2002), whilst eliciting a curvilinear effect of internal knowledge, finds that external knowledge enhances product innovation in robotic firms. Similarly, Diaz-Diaz and Saa-Perez (2014), examining the internal, external sources of knowledge and

innovation relations of Spanish industrial firms, show that a firm's internal knowledge has a curvilinear relationship with product innovation, whereby the benefit of internal sources of knowledge has a diminishing effect on innovation. However, the interaction between external and internal sources of knowledge diminishes this negative effect and enhances the innovation performance. Roper and Hewitt-Dundas (2015), examining Irish manufacturing firms, find a positive impact of internal R&D activities and external search on product and process innovation, however, existing knowledge stocks have no effect. It is argued that firms' knowledge flows from internal R&D investment and external search are more important than existing knowledge investments. On the other hand, some studies show an adverse effect of external and internal knowledge on innovation. Ye et al. (2016) find that while external knowledge has a curvilinear relation with innovation in Chinese firms, internal knowledge has a positive effect. It is argued that internal knowledge may be more readily absorbed and the sourcing external knowledge may be more difficult compared to internal knowledge. Similarly, Berchicci (2013), examining Italian manufacturing firms, finds a curvilinear relation between external knowledge sourcing through R&D activities and innovation performance. Moreover, Li-Ying et al. (2014) find a negative effect of external technical knowledge search on Chinese firms' innovation performance.

Whilst these results show positive and negative effects of internal and external knowledge on innovation, it is contended that firms' interactions with other organisations allow knowledge flows, which then facilitate the development of new products, enhance innovation and deliver competitive advantage (Grant 1996a; Lorenzoni and Lipparini 1999; Lin et al. 2013). When firms' knowledge base does not match with the products, interfirm relationships provide firms with new knowledge (Grant 1996b). As the development of new products is a long process, this new knowledge exploitation shortens the development stage and enables the introduction of new products (Knudsen 2007; Rothaermel and Deeds 2004).

New knowledge creation is mostly made possible through establishing knowledge sharing relations with other firms where the transfer occurs reciprocally (Gilsing and Duysters 2008; Yang et al. 2014b). This exchanged knowledge becomes a base for the creation of new knowledge, which then facilitates problem solving, thus enhancing product and process innovation (Bresman et al. 2010; Andersson et al.

2001a; Kotabe et al. 2003). Kogut and Zander (1992, p.383) state that “*what firms do better than markets is the sharing and transfer of the knowledge of individuals and groups within an organization*”. It is further argued that transferring knowledge is difficult due to its non-codified, tacit and ‘sticky’ nature (Kogut and Zander 1992; Szulanski 1996; Inkpen 2000). Applying this to interfirm knowledge sharing relations, it can be asserted that sharing between firms is more difficult than doing so within an organisation (van Wijk et al. 2008; Easterby-Smith et al. 2008; Tortoriello et al. 2012). However, interfirm knowledge exchange is a necessary and important way of knowledge creation and generating innovations.

Dyer and Singh (1998, p.665) define interfirm knowledge sharing as “*a regular pattern of interfirm interactions that permits the transfer, recombination or creation of specialized knowledge*”. Knowledge sharing process takes place in all organisations’ lives and doing so can lead to improved performance, absorptive capacity, innovation and other capabilities (Foss et al. 2010; Easterby-Smith et al. 2008; Dyer and Singh 1998; Appleyard 1996; Hoopes and Postrel 1999). The terms ‘sharing’, (Hansen 1999); ‘exchange’ (Arikan 2009; Cousins et al. 2011; Sammarra and Biggiero 2008); ‘transfer’ (Tsai 2001; Dhanaraj et al. 2004); ‘flow’ (Gupta and Govindarajan 2000; Schulz 2001; 2003); ‘spillover’ (Yang et al. 2010; Phene and Tallman 2014) and ‘acquisition’ (Buckley et al. 2009; Friesl 2012) are often used interchangeably in the literature. (Foss et al. 2010; van Wijk et al. 2008). For instance, ‘knowledge transfer’ is one of the widely used terms, which Phelps et al. (2012) define as the intention of sharing and acquiring knowledge between a source and a receiver. Easterby-Smith et al. (2008) define this as the firms’ learning intent from the experience of another firm. Similarly, van Wijk et al. (2008) define knowledge transfer as the exchange of experience and knowledge of other firms, whilst Arikan (2009) defines interfirm knowledge exchanges as interactions between firms that include voluntary or involuntary forms of knowledge exchange. Based on these similar conceptualisations, in this study knowledge sharing is perceived as an exchange pattern through interfirm interactions (Sammarra and Biggiero 2008). The terms defined above are used interchangeably throughout the study (Foss et al. 2010).

Knowledge flows are examined in different levels and contexts, such as within the firm (Collins and Smith 2006; Haas and Hansen 2007), in relation to multinational

firms (Gupta and Govindarajan 2000; Bjorkman et al. 2004; Almeida and Phene 2004; Phene and Almeida 2008; Tsai 2001), joint ventures and alliances (Dhanaraj et al. 2004; Mowery et al. 1996; Tsang 2002; Simonin 2004; 1999a; 1999b; Inkpen 1996), buyer-supplier relations (Lawson et al. 2009; Squire et al. 2009), clusters (Alcacer and Zhao 2012; Bell 2005) and for business groups (Lee and MacMillan 2008; Lee et al. 2010; Lee et al. 2016). At the firm level, firms generate their own knowledge and integrate it into new products (Katila 2002). Also, knowledge generated outside the firm is shared within the firm to generate innovations (Tortoriello 2015). Within a firm, interaction of individuals with diverse knowledge facilitates problem solving and increases innovation (Cohen and Levinthal 1990). Zahra et al. (2007), examining the knowledge relations within the firm, find a positive effect of formal and informal knowledge sharing related to knowledge in technologies, industry conditions, customers and competitors on the technological capabilities of manufacturing firms. Shu et al. (2012), examining knowledge exchange and innovation relations within firms in China, find that knowledge exchange increases product innovation.

In the context of alliances, knowledge sharing is an important part of the learning process (Kale and Singh 2007). That is, strategic alliances are considered as a knowledge exchange mechanism, whereby firms are embedded in a network of interfirm relations (Rothaermel 2001b; Mowery et al. 1996). Regarding which, firms in R&D alliances can be both the sources and recipients of knowledge (Schulze et al. 2014). The aim of transferring knowledge among members is to foster innovation (Inkpen 2000; Jiang and Li 2009). Strategic alliances benefit from knowledge spillovers among partners in new product development. Moreover, firms that form alliances integrate and develop new knowledge, which can be used to generate new product and process innovations (Steensma et al. 2012; Jiang and Li 2009; Fang 2011). Jiang and Li (2009), in a survey of German strategic alliance firms, show that knowledge sharing contributes the firms' innovation performance. The authors argue that firms that form strategic alliances learn from each other and develop new knowledge in order to produce new goods and services. Frankort (2016), investigating the relationship between knowledge acquisition through R&D alliances and new product development in manufacturing firms, elicit that knowledge acquisition through R&D alliances has a positive impact on firms' new product development.

As is the case with alliances, joint ventures enhance new product performance through knowledge absorption effectiveness in the form of sharing existing knowledge and assimilating partner knowledge (Yao et al. 2013). For instance, in international joint ventures, knowledge acquired from the foreign parent enhances the performance of the joint venture through leveraging its capabilities, thereby providing the partnership firms product and process technology and know-how (Lyles and Salk 1996; Steensma and Lyles 2000). Similarly, one of the reasons for an acquisition is to access knowledge of the acquired firm and transfer this knowledge to the acquirer (Bresman et al. 2010). Acquisitions that provide firms with technological inputs, affect acquiring firms' innovation and this innovation output is enhanced by the acquired firms' knowledge base. However, if the acquired knowledge is similar to the firm's existing knowledge base, it may well not enhance the innovation performance of the firm (Ahuja and Katila 2001). Yao et al. (2013) show that in Chinese international joint ventures, knowledge absorption effectiveness enhances the effect of knowledge complementarity on new product performance. Sullivan and Marvel (2011) find a positive significant relationship between technological knowledge acquisition and product innovativeness in technology ventures in the USA. However, Wang and Libaers (2016) show a curvilinear relationship between technological knowledge acquisition and innovation performance of manufacturing ventures in emerging economies.

Another context is the clusters (district) that facilitates the ability to integrate knowledge with internal relations (Alcacer and Zhao 2012; Connell et al. 2014). Knowledge exchanges among member firms of clusters help them to learn from each other, create their own knowledge and knowledge exchanges determine the innovation performance differences between clusters (Mitchell et al. 2014; Arikan 2009; Lai et al. 2014). For instance, Bell (2005) suggests that firms in a cluster have better access to knowledge than firms outside and finds that Canadian mutual fund firms within the cluster innovate better than their counterparts outside. Lai et al. (2014) examine the effect of knowledge acquisition and dissemination on innovation performance of cluster firms in Taiwan and find that knowledge management in the form of knowledge creation, acquisition and dissemination affect the innovation performance of cluster firms. Zhang and Li (2010) emphasise the role of relations with service intermediaries in the innovation of new ventures. They argue that ties with these firms may broaden

firms' search scope as well as reducing the search cost and making a contribution to firm innovation. The authors examine the new ventures' ties with service intermediaries, such as technology service firms, accounting and financial service firms, law firms, talent firms and product innovation, in the context of a technology cluster in China. The results show a positive impact of relations on product innovation of firms in a cluster.

Knowledge exchange is also one of the primary sources of innovation in multinational corporations (Noorderhaven and Harzing 2009). The existence of such corporations is attributed to their transfer and exploitation of knowledge efficiently within their boundaries (Gupta and Govindarajan 2000; Luo 2005). Their advantage lies in the idea that knowledge developed within the MNC is exploited in other parts, such as headquarters and subsidiaries (Minbaeva et al. 2003). Knowledge flows among subsidiaries of a multiunit firm allow firms create new ideas to innovate as well as providing opportunities to learn from each other (Mudambi and Navarra 2004; Bowman and Ambrosini 2003; Tsai 2001). Also, MNC subsidiaries exchange knowledge with external firms in their host countries. Whilst knowledge that is created with external firms, such as local suppliers and buyers, is less transferable than the internally developed knowledge within the MNC, it could provide the base for the similar product and processes of subsidiaries within the MNC and much of it may be transferred to subsidiaries (Foss and Pedersen 2002). Regarding which, in a study of two multinational companies, Tsai (2001), characterising knowledge flows as network position, finds that sharing knowledge among business units of multinational firms increases subunits' innovation performance.

Multinational firms, also transfer overseas knowledge for transnational new product development capability (Subramaniam and Venkatraman 2001). Subramaniam (2006) examines the effect of cross-border knowledge integration on transnational product development in MNC divisions and finds that it has a positive effect on product development when it is transferred through cross-national collaboration. It is argued that knowledge transfer through collaboration on product pricing, planning new products and launching new ones increases the effect of knowledge integration on new product development. On the other hand, Kotabe et al. (2007) find a curvilinear relationship between international knowledge transfer and

innovation performance for U.S. based multinational firms in the pharmaceutical industry. Specifically, this result shows that innovation performance increases up to an optimal level, however, beyond that point international knowledge transfer leads to a decline in innovation performance. The authors conclude that too much knowledge transfer may reduce the benefits in terms of innovation performance.

Suppliers, buyers and manufacturers are the main sources of the innovation process (von Hippel 1988) in that the necessary knowledge is created through collaboration with these actors (Nonaka 1994). The need for knowledge exchange relationships between buyer and supplier stems from the fact that knowledge integration for production cannot fully be achieved within the firm (Grant and Baden-Fuller 1995). Exchange relationships with suppliers, buyers and customers determine the extent of knowledge flows into and out of the firm (Fey and Birkinshaw 2005; McEvily and Marcus 2005). Relations with suppliers facilitate the transfer of tacit knowledge, reduce the costs and quality problems, whilst customer relationships allow firms to improve product designs through accessing the customers' technical skills, preferences and receiving feedback (Freel 2000; Lawson et al. 2009; Cheung et al. 2011; Takeishi 2001; Mahr et al. 2014). Knowledge and technical expertise acquired from suppliers and customers can minimise the problems related to the product launch stage. Moreover, firms may obtain new ideas about materials and product designs from suppliers (Cousins et al. 2011). Similarly, customers' knowledge and ideas about new products can be an instructive source for the innovation process (Kogut 2000; Schoenherr and Swink 2015; Potter and Lawson 2013; Chen et al. 2011). For instance, young technology based firms benefit from market and technological knowledge acquisition from customers in the development of new products (Yli-Renko et al. 2001). At the interfirm level, Ahuja (2000) emphasises the role of collaborative linkages for sharing resources formed among independent firms in relation to innovation performance, whereby direct and indirect ties facilitate knowledge sharing among partners. For instance, Ritala et al. (2015), conducting a study on Finnish firms, show a positive impact of knowledge sharing with external partners on innovation. Spencer (2003) emphasises the importance of firms' sharing of explicit knowledge with their national and global innovation systems, finding a positive relation between knowledge sharing and innovation performance of flat panel industry firms.

The empirical evidence generally shows a positive impact of knowledge sharing with external firms, such as suppliers, buyers, competitors, universities and research institutes on innovation performance (Leiponen 2005; Escribano et al. 2009; Roper et al. 2010; Leiponen 2012; Vega-Jurado et al. 2009). In the context of buyer supplier relationships, Cousins et al. (2011), examining the U.K. manufacturing firms, find that technical exchange with suppliers has an impact on the buyer product development performance. Lawson et al. (2009) show that knowledge sharing between buyer and suppliers increases the supplier's contribution to product and process designs, product quality and buyer's product development performance for U.K. manufacturing firms. Cavusgil et al. (2003) argue that knowledge transfer among suppliers and buyers is important in interfirm cooperation and find a positive effect of tacit knowledge transfer on innovation performance of manufacturing and service firms. Chen et al. (2011) show a positive effect of knowledge search intensity from suppliers, buyers and competitors on the innovation performance of Chinese firms. Lakshman and Parente (2008), investigating the effect of knowledge sharing relations between Brazilian automobile manufacturers and suppliers on product performance, find that high knowledge sharing with the latter results in increased product performance of the former. A firm may be both the source and recipient of knowledge, because interfirm knowledge flow is a reciprocal activity (van Burg et al. 2014) and consequently, supplier firms also benefit from knowledge flows. For instance, Toyota's knowledge sharing routines with its suppliers within the production network allow the latter to get access to Toyota's production related knowledge, which increases their productivity (Dyer and Nobeoka 2000; Dyer and Hatch 2006). Regarding, knowledge flows related to technology transfers and technical exchanges are found to have a positive effect on product and process design improvements for Japanese and U.S. automotive components suppliers (Kotabe et al. 2003).

In contrast, Takeishi (2001) puts forward a different perspective on relationships, arguing that a firm's too deep reliance on suppliers may deteriorate its ability to differentiate itself from the competitors who share the same ones. In particular, high knowledge sharing may limit the generation of new ideas for new product development. For instance, knowledge sharing between a supplier and a customer for long duration, can diminish the heterogeneity of knowledge (Jean et al. 2014). Similarly, Knudsen (2007) highlights the negative impact of customer



involvement on innovation, which stems from a narrow focus on a limited number of customers. At the same time, creating knowledge with customers and transferring it may be costly (Mahr et al. 2014). For instance, Lau et al. (2010) find that information sharing with the suppliers and customers does not affect product innovation of Chinese manufacturers. The authors argue that firms may restrict their capability of developing new products by limiting themselves to information acquired from current customers and suppliers. Schoenherr and Swink (2015), examining U.S. manufacturing firms, show that while integration of external knowledge from customers and competitors enhances product innovation, supplier relations have no effect. Also, external knowledge in the form of R&D activities may not be beneficial for innovation performance, since all firms, including competitors, may have access to publicly available knowledge (Grimpe and Kaiser 2010). Un and Asakawa (2014) investigate the impact of knowledge firms acquire through R&D collaborations with suppliers, customers, competitors and universities on the process innovation of manufacturing firms. Their results depict that while R&D collaborations with suppliers and universities positively affect it, customer collaboration has no impact and collaborations with competitors have a negative impact.

Knowledge sharing is examined regarding different domains, such as technologies, sales and marketing, product designs, distribution, know-how and R&D in previous studies (Schulz 2001; Tsai 2002; Maurer et al. 2011; Gupta and Govindarajan 2000). Also, studies focus on tacit, explicit knowledge or explorative, exploitative knowledge distinctions as well as the above domains (Hansen 1999; 2002; Im and Rai 2008; Lee et al. 2010). Explorative and exploitative knowledge flows, which can be defined as the development of new knowledge and the refinement of existing knowledge through interactions with other firms, respectively, enhance the development of new products, processes and the existing innovative outputs (Faems et al. 2005; Rosenkopf and Nerkar 2001; Kim and Atuahene-Gima 2010). The impact of explorative and exploitative knowledge sharing on innovation may depend on the firms' context (Gupta et al. 2006). For instance, Su et al. (2011) argue that the interaction effect of explorative and exploitative learning on firm performance is negative when the organisational structure is mechanistic, whereas, it is positive when there is an organic structure. Zhan and Chen (2013) suggest that the impact of exploration and exploitation capabilities on competitive and financial outcomes is

stronger when international joint ventures operate in an autonomous organisational environment. The authors find empirical support for their argument that context affects the explorative learning, exploitative learning and performance relationship in different ways. In the present study, the business group, a dominant form of organisation in emerging economies is investigated, because the embedded relations within one may allow for various opportunities for the exploration and exploitation of knowledge (Capaldo 2007).

The next section examines the role of business group affiliation in knowledge sharing and innovation relations. Business group research has provided limited evidence as to whether the strategies of affiliated firms differ from independent firm strategies and whether these strategies make a difference to the former's performance. Investigating affiliate level strategy concepts enables understanding of the role of the groups (Carney et al. 2011; Lamin 2013). However, research on the knowledge sharing impact is limited in the context of business groups, except for some notable studies (Lee et al. 2010; Lee and MacMillan 2008, Lee et al. 2016). Also, including a comparable sample of independent firms in business group research in the context of an emerging economy can increase the generalisability of the results (Yiu et al. 2005) and can provide insights into what competitive advantages or disadvantages affiliates have over independent firms (Yiu et al. 2007). Accordingly, the next section addresses this gap in the literature by discussing business group affiliation, knowledge sharing and innovation relations in detail.

### **2.5.1 Business Group Affiliation and Innovation**

In emerging economies, due to the lack of external institutions and efficient markets, business groups contribute to innovation of affiliates through providing an internal capital and labour market for resources, such as finance, technology, knowledge and trained labour (Mahmood and Mitchell 2004; Hobday and Colpan 2010; Castellacci 2015). When external markets do not perform well, business group firms have better access to financial capital within the group and achieve better R&D investments than independent firms. The coordination and internal transactions in a group may increase the affiliated firms' innovativeness through access to internal resources, such as financial capital, technology and human capital. Also, given the lack

of skilled labour, affiliates provide workers with education and training. Since a business group provides member firms capital, labour, incentives for innovation, they might have more advanced capabilities to recombine inputs into complex product and processes than independent firms (Dau et al. 2015).

Firm ties among members increase trust, which leads to the transfer of knowledge, something that is difficult to acquire through market interactions (Hsieh et al. 2010). Moreover, knowledge spillovers from the research of other firms in a group can make affiliate firms more innovative than independent ones. In fact, internal labour and technology markets have an important role in facilitating knowledge sharing among affiliates and learning from each other through such knowledge flows facilitates innovation (Belenzon and Berkovitz 2010; Guzzini and Iacobucci 2014a; Hsieh et al. 2010). Consequently, buyer-supplier ties within a group become more important in emerging economies, where the institutions for exchange of knowledge and infrastructure for innovation are insufficient (Mahmood et al. 2011; Chang et al. 2006). Buyer-supplier ties in a group develop as groups create affiliates that produce components or use the end products. Also, internal buyer-supplier ties provide a trustworthy setting for exchanges, particularly knowledge and these links among affiliates enhance innovation performance (Mahmood et al. 2013; Ahuja 2000).

The research on groups generally show a positive relation between affiliation and R&D activities, which are considered as indicators of innovation (Filatotchev et al. 2003; Cefis et al. 2009; Guzzini and Iacobucci 2014b). It is proposed that a positive relation between affiliation and R&D is compatible with the presence of the internal capital market, which allows affiliated firms to coordinate their R&D investment and to internalise knowledge spillovers (Guzzini and Iacobucci 2014a). Castellacci (2015), comparing the innovativeness of business group affiliated and independent firms in Latin American countries, shows that group firms are more innovative than independent ones and attributes this result to their development through knowledge spillovers. Hsieh et al. (2010) show that group affiliates innovate more than independent firms in the Taiwanese context. Choi et al. (2011), examining Chinese firms, find a positive impact of group affiliation on innovation. Wang et al. (2015), investigating Chinese manufacturing firms, show a positive effect of group affiliation on innovation performance. Belenzon and Berkovitz (2010) elicit that affiliates

perform better in terms of innovation, according to a study of European firms. Lodh et al. (2014) argue that affiliation increases the effect of family ownership on innovation in Indian firms.

However, ongoing relations could also inhibit innovation by creating resource redundancy owing to the use of existing knowledge (Mahmood et al. 2013). That is, firms affiliated with groups may focus on local search within the group from other affiliates instead of acquiring new knowledge from outside firms (Mahmood et al. 2013) and this existing knowledge might not create new opportunities for innovations. Despite business group firms benefiting from intragroup ties through knowledge sharing, the benefits from the density of these ties may decline as market based institutions develop and support innovation (Mahmood et al. 2013). That is, while business group affiliation positively affects innovativeness of affiliates in emerging economies, this positive impact may turn negative with the development of institutions, as more efficient markets for technology transfer and availability of research facilities could reduce the benefits of groups' internal market (Chang et al. 2006). For instance, Chang et al. (2006) examine the effect of group affiliation on innovation and the moderating role of institutional infrastructures on this relationship in South Korean and Taiwanese firms. The results show a positive impact of affiliation on innovation in Korean firms, but not in Taiwanese ones. Also, this benefit of affiliation has diminished as institutions have developed in both countries.

In a different study, Mahmood and Mitchell (2004) argue that business groups' share in an industry both facilitates and inhibits innovation in that industry and find a curvilinear impact of this share on innovation in Korean and Taiwanese groups. That is, the authors elicit that the increasing presence of groups in an economy first enhances innovation, however, after a certain point this presence limits technological variety and hinder innovation, because of high entry barriers for independent firms. Mahmood et al. (2013) argue that the density of intragroup buyer-supplier ties both facilitates and inhibits group innovativeness. The benefits stem from the combination of existing knowledge and the constraints may be the result of resource redundancy. Examining Taiwanese groups, the authors find that buyer-supplier density has a curvilinear effect on innovation. These changes in affiliation benefits depend on the institutional developments in specific emerging economies, however, based on the

general arguments on group affiliation, it could be that groups have broader facilities for their member firms by providing them necessary resources for innovative activities, which may not be available to independent ones.

### **2.5.2 Business Group Affiliation and Knowledge Sharing**

Each affiliated firm under the control of a business group is a member of an interfirm network in which firms share and combine their resources and capabilities (Mursitama 2006; Hsieh et al. 2010; Chang and Hong 2000). Affiliated firms benefit from economic and social ties and relations through exchanging resources and organising their strategies and activities in product or other markets. These ties reduce transaction costs and facilitate the transfer of resources within the group (Khanna and Rivkin 2001; Keister 1998; Khanna and Rivkin 2006; Chang et al. 2006; Chittoor et al. 2009). Even though they operate in different industries, member firms in a business group may achieve competitive advantage by internalising trading activities through sharing resources with other members of the same group (Chen and Chu 2012). For instance, Korean business group affiliated firms benefit from group membership through sharing intangible and financial resources with other member firms in terms of profitability (Chang and Hong 2000). In a study of Indonesian business groups, Mursitama (2006) shows that sharing technological and managerial capabilities contributes to firm productivity. Further, affiliated firms share intangible resources, human resources, R&D expenses, business opportunities, technology, raw materials, foreign markets, knowledge and expertise (Garg and Delios 2007; Strachan 1976; Chang 2006; Chang and Hong 2002; Lamin 2013).

In the present research, whether affiliated firms benefit from knowledge exchanges in terms of innovation performance is addressed (Lamin 2013). In the literature, interfirm relations among business group firms are compared to the intraorganisational interactions among subsidiaries of multinational companies (Lee and Gaur 2013; Lee and MacMillan 2008; Lee et al. 2016). Consequently, examples from the literature on multinational firms, such as knowledge transfers among subsidiaries and subsidiary-host country local firm relations, are integrated with the discussion about the business group affiliation effects throughout the review.

It is asserted that the processes of interfirm knowledge transfer are affected by the nature of the network type in which organisations are embedded (Inkpen and Tsang 2005). For instance, firms within a district (cluster) may show different patterns of knowledge transfers, which are not available to the firms outside of it (Easterby-Smith et al. 2008). Regarding which, knowledge that, is developed internally or imported from other firms, is shared among industrial district firms (clusters), however, for non-district firms it is difficult to access to such knowledge (Tallmann et al. 2004). A different context is that of multinational firms with several subsidiaries operating in home and host countries. MNC subsidiaries internalise knowledge from the subsidiary itself, headquarters, other subsidiaries and other firms in the host and home countries (Phene and Almeida 2008). Consequently, they have two different networks, such as the relations within the MNC and the external network that they have in the local market (Andersson et al. 2001b). Accessing, sharing and creating knowledge by a subsidiary with headquarters and other subsidiaries within the MNC network as well as with local firms in the host country network contributes to its innovative process (Almeida and Phene 2004). Moreover, subsidiaries can impact on sister firms' innovation through sharing knowledge with other subsidiaries and headquarters. Their interfirm relations permit both the absorption and outflow of knowledge. This knowledge flow increases the knowledge base of other firms, thereby contributing to their innovation (Phene and Almeida 2003).

Similarly, business group firms benefit from knowledge exchange among themselves and spillovers within group boundaries, because the repeated use of knowledge within the group enhances the learning process of affiliates (Lee et al. 2016; Wang et al. 2015; Manikandan and Ramachandran 2015; Kim et al. 2010). Knowledge sharing is easier among affiliates within the same business group than it is among unrelated firms and these transfers may not be available to other interfirm relationships (Chang et al. 2006; Lamin 2013). In addition, labour mobility among affiliated firms facilitates the transfer of knowledge within the group. In particular, groups facilitate the sharing of technological knowledge among affiliates through the internal labour market and interfirm ties, when there are no well-developed external conditions to rely on (Chang et al. 2006; Lee et al. 2016; Chang and Hong 2002).

Business groups create an internal capital market that finances R&D, with group firms coordinating their R&D activities and sharing the knowledge created through these activities (Guzzini and Iacobucci 2014b). Affiliates that do not conduct R&D activities, make use of the new products or processes developed in other affiliated firms where such activities are carried out. Therefore, firms use the knowledge created by the group which enhances innovation performance (Blanchard et al. 2005; Leiponen and Helfat 2011). For instance, Blanchard et al. (2005) examine the effect of knowledge produced by R&D activities of the other affiliates on the productivity of the firm in French groups. Their results show that the R&D activity carried out by an affiliate of a group has a positive impact on the productivity of other affiliated firms, whereby the knowledge created spreads amongst the group. Lee and MacMillan (2008), investigating managerial (procedural and coordinative) knowledge sharing in Korean chaebol affiliates and their subsidiaries, demonstrate that while coordinative knowledge sharing among affiliates has a positive impact on affiliates' subsidiary performance, procedural knowledge sharing has none. Lee et al. (2016) emphasise the importance of knowledge sharing in business groups in the absence of knowledge and resources in the markets, arguing that knowledge flows among firms that belong to a business group have a different productivity impact than for among firms with distant relationships. Examining these relations in Korean firms, the authors find that group affiliated firms benefit from affiliates' knowledge spillovers more than independent firms and conclude that knowledge is transferred and exploited better within a group.

Affiliated firms not only engage in knowledge sharing relations with group member firms, but also have exchange relations with their partners outside their boundaries. Group reputation allows firms to develop collaborations with foreign firms through group name and recognition and exploit knowledge from their relationships (Castellacci 2015). Group firms' political ties facilitate access to technological knowledge and research opportunities from foreign firms, since foreign firms provide knowledge to partners that have a reputation (Mahmood and Mitchell 2004; Bugador 2015; Chang et al. 2006; Chari and David 2012). For instance, knowledge exchanges increase a subsidiary's importance for product development in an MNC in that it can have an impact on other subsidiaries through sharing externally acquired knowledge with sister subsidiaries (Andersson and Forsgren 2000; Phene and Almeida 2003;

Adenfelt and Lagerstrom 2006). Similarly, in groups, the acquired knowledge facilitates the absorption of new external knowledge. This acquired knowledge becomes a base for the use of new knowledge, because the external knowledge utilisation is based on prior knowledge (Cohen and Levinthal 1990). As such, group firms have high absorptive capacity, which allows for the exploitation and integration of new knowledge from other firms within and outside the group. This absorptive capacity then facilitates product and process innovations through the ability to integrate new knowledge (Cohen and Levinthal 1990; Castellacci 2015; Phene and Almeida 2003; Lavie and Rosenkopf 2006).

This thesis focuses on different characterisations of knowledge in the empirical chapters. In the first empirical chapter, the focus is on tacit and explicit knowledge distinction. The second empirical chapter focuses on procedural type of knowledge which is more tacit in nature. The last empirical chapter differentiates between explorative and exploitative knowledge. Considering these different aspects of knowledge allows the researcher to understand whether business group affiliated firms' knowledge sharing within and outside their boundaries relates to tacitness of knowledge, whether social capital facilitates sharing more procedural and tacit type of knowledge and how innovation relates to exploration and exploitation of knowledge with other firms. Also, it helps to see whether affiliates engage in exploration and exploitation of knowledge to innovate more than independent firms do and whether affiliation has a facilitating role in sharing knowledge which is more tacit in nature through social capital that groups create. Consequently, the use of these different types of knowledge makes it possible to understand these impacts related to specifically groups' nature, social capital and innovation.

In the empirical chapter, which examines affiliated firms' knowledge sharing with other affiliates within the group and with other firms outside the group, tacit and explicit knowledge distinction is used. The aim of this examination was whether affiliates share tacit and explicit knowledge with sister affiliates more than they do with firms outside the group and whether the exchange of knowledge within and outside the group boundaries relates to tacitness of knowledge. Tacitness of knowledge makes it difficult to share. Also, tacit knowledge is more embedded in close relations (Becerra et al. 2008) and sharing such knowledge requires active involvement of firms



(Simonin 1999b; Dhanaraj et al. 2004). A business group is an example of organisation which provides this facility through relations among member firms (Lee et al. 2016). Affiliates' exchange of tacit knowledge may be observed more with other affiliates within a group than with firms outside because of their close relations and affiliates may be more volunteer to exchange such knowledge. Explicit knowledge is codified, more related to standardised procedures and easier to share (Dhanaraj et al. 2004), however, this exchange requires several procedures and communication capacity (Fey and Fru 2008), which can be observed more between affiliates of a group than with independent firms because of their communication convenience. Therefore, these characteristics of tacit and explicit knowledge and the close relations between firms in business groups (Lamin 2013) make the investigation of these types of knowledge exchanges relevant considering the within and outside group distinction.

In the empirical chapter, which examines social capital, knowledge sharing and affiliation relations, the dependent variable, knowledge sharing, is more related to procedural type of knowledge, such as managerial practices and marketing know-how (Gupta and Govindarajan 2000; Schulz 2001). This type of knowledge is more tacit in nature than other types, such as declarative or codified knowledge (Gupta and Govindarajan 2000) and may be difficult to share because of its embeddedness in complex processes (Dhanaraj et al. 2004). Therefore, social capital can facilitate the sharing of such knowledge. In this chapter, the focus is more on the facilitating role of social capital in knowledge sharing rather than exploring the impact of social capital on various types of knowledge (Maurer et al. 2011). Also, the further focus is on whether or not group affiliates with high social and close relations benefit from social capital in terms of sharing knowledge differently from their independent peers.

In the empirical chapter, which examines knowledge sharing, innovation and affiliation relations, explorative and exploitative knowledge categorisation is used (March 1991), because it is suggested that exploration and exploitation of knowledge are closely related to innovation activities (Rosenkopf and Nerkar 2001; Faems et al. 2005; Rothaermel 2001a). Also, from an examination of exploration and exploitation in the context of intra and interfirm networks, it is argued that these knowledge exchange strategies may have different effects on innovation in various settings (Gupta et al. 2006; Coombs et al. 2009). In particular, the context in which firms operate may

have a moderating impact on the relationships between knowledge sharing and innovation (Zhan and Chen 2013; Su et al. 2011). Business group affiliates utilise and generate knowledge both with other affiliates within the group and with their relations outside. Groups' internal market creates an infrastructure for promoting exploration and exploitation to foster innovation (Mahmood et al. 2011). Explorative and exploitative knowledge sharing activities can be conducted in both settings and affiliates' internal and external embeddedness may have a conditioning (favourable or negative) impact on the relationship between two types of knowledge sharing and innovation. Consequently, in this empirical chapter the examination of explorative and exploitative knowledge sharing in the context of business group affiliation is considered.

## **2.6 Conclusion**

In this chapter, first, since knowledge sharing is not easy and readily accomplished, the role of the social capital in knowledge sharing is addressed. Secondly, the concept of the business group, which is the dominant form of organisation in emerging economies, was introduced. In addition, because social capital is associated with doing business in emerging economies, the role of business groups in creating social capital for their members was reviewed. Thirdly, the importance of knowledge and the impact of sharing knowledge on innovation were developed. This part suggested that knowledge sharing is essential in developing innovations. Moreover, it was argued that knowledge sharing relations are facilitated through affiliation since groups provide a setting where members can communicate easier than their independent peers. The next chapter continues with explanation and justification for the research methodology used in this study.

## **Chapter 3 Research Methodology**

This chapter includes the research philosophy, research design, variables and measurement model assessment related to the study. In the first section of this chapter, the epistemological approach underlying the research is explained. The second section describes the research design and covers the research context, unit of analysis, sample, data collection and ethical considerations. In the third section, the variables are introduced. This section starts with a brief description of measurement of the variables and continues with an assessment of the measurement model. The fourth section of this chapter explains the ways to detect the common method variance and the remedies used in this study. Finally, the fifth section discusses nonresponse bias.

### **3.1 Paradigm Assumptions and Philosophy**

Paradigm assumptions about the ontological, epistemological and methodological nature of social science affect the chosen research strategy. Ontology pertains to the consideration of whether social entities are objective entities that have a reality external to social actors, or whether they are social constructions built up from the perceptions of these actors (Bryman and Bell 2003). Epistemology defines what is known, the nature and validity of knowledge used and produced (Duymedjian and Ruling 2010). Methodology refers to the theory of how research should be undertaken (Saunders et al. 2003). The objectivist approach to social science involves adopting a realistic ontology, a positivist epistemology and a nomothetic methodology. Under realism, it is assumed that social reality has an independent existence prior to human cognition (Johnson and Duberley 2003). Positivism refers to the belief that social science research should imitate how research is undertaken in the natural sciences (Lee 1999). Nomothetic methodology includes the quantitative analysis of a few variables across large samples (Larsson 1993). On the other hand, the subjectivist approach pertains to assuming a nominalist ontology, interpretivist epistemology and idiographic methodology (Yates 2004; Bryman 2008). Nominalism refers to the view that social reality does not lie within an external world (Williams and May 1996). Interpretivists maintain that people and the physical and social artifacts that they create, are fundamentally different from the physical reality examined by natural

science (Lee 1991). Idiographic methodology includes qualitative analysis techniques (Luthans and Davis 1982).

Generally, while the positivist approach is related to testing of the theories, the interpretivist epistemology is associated with their generation (Bryman 2008). Positivism pertains to making rational choices and positivist researchers adopt a deductive approach, quantitative data, experiments, surveys and/or statistics (Neuman 2003). A deductive approach requires a testing of a theory through hypothesis (Bryman 2008), which means that theory precedes the research. On the other hand, the interpretivist researcher uses an inductive approach, qualitative study, interviews, participant observation and/or interpretations (Bryman 2008). In qualitative studies, theory is produced after the research. Since this study is aimed at testing a theory through hypotheses, quantitative data and variables, it is based on a positivist approach. Hence, under the positivist paradigm the adopted research strategy and research design are explained below.

### **3.1.1 Research Strategy**

In broad terms, quantitative and qualitative strategies are adopted by the researchers according to positivist and interpretivist epistemology, respectively (Bryman 2008). The chosen methods (survey, questionnaire, interview etc.) for these two strategies reflect their characteristics. While researchers who adopt a quantitative strategy deal with the measuring of variables and testing hypotheses, qualitative researchers focus on investigation of cases (Neuman 2003). Quantitative studies are helpful for reducing elusiveness, however, they may not reveal the causal relationships (Gilbert 2008). On the other hand, the qualitative strategy researcher tries to understand social life through recursive collection of data (Neuman 2003). In this study, in line with the research question and deductive approach, a quantitative strategy is adopted as the research strategy. The research design pertaining to the quantitative strategy is explained in the following part.

### **3.1.2 Research Design**

While there may be no distinct differences in terms of the adopted designs in quantitative and qualitative research, generally, experimental, cross-sectional and longitudinal designs carried out through survey and structured interview methods are related to a quantitative strategy. In contrast, a qualitative strategy with cross-sectional and longitudinal designs involves employing interviews and ethnographic, participant observation, focus groups and/or other discourse analysis methods (Bryman 2008; Gilbert 2008). Under cross-sectional design, the data is collected in a moment of time, whereas for longitudinal design the data are collected on at least two or more occasions (Bryman 2008; Gilbert 2008). The completion of the study in a limited time is one of the advantages of the cross-sectional design (Gilbert 2008), however, it may have some disadvantages related to constructing the causal relationships between the variables. In this study, after taking into account data availability, cross-sectional design is used through implementing a questionnaire.

## **3.2 Research Design**

### **3.2.1 Research Context**

This study is conducted in the context of Turkish business group (holding) affiliated and non-affiliated (independent) firms. Turkish business groups (generally termed ‘holding’) are defined as “*legally independent, privately held and publicly owned, companies operating in multiple industries, which are controlled through a top holding company with various equity and non-equity arrangements*” (Colpan 2010, p.495). The majority of large firms in Turkey operate under a group and the business groups are mostly organised around a holding company (Gonenc et al. 2004). The group firms are legally independent companies that have their own shareholders and boards. As with many business groups in emerging economies, equity holdings and interlocking directorates are widely used to control a large number of firms within Turkish business groups (Colpan 2010). Turkish business groups diversify across several industries including food, electronics, automobiles, construction, chemicals, retailing and financial services (Gunduz and Tatoglu 2003). Group firms have strong solidarity among themselves. Group affiliation can facilitate knowledge sharing by

providing strong social capital among member firms, which may be less available for the independent firms. In addition, group reputation makes member firms attractive for other firms, such as suppliers, buyers or competitors to cooperate and create intensive business relations. Consequently, this context is deemed appropriate for investigating knowledge sharing, social capital and innovation relations in an emerging economy.

### **3.2.2 Unit of Analysis**

It is problematic to move from the individual to the organisational level of analysis when investigating interfirm relations (Pennings and Lee 1998). Since interfirm relationships are managed by individual ‘boundary spanners’, who interact on behalf of their organisations across boundaries, micro behaviours at the interpersonal level generate macro outcomes at the interorganisational level (Capaldo 2007). Knowledge is created and shared by individuals, with knowledge flows among individuals affecting firm behaviour and performance (Squire et al. 2009). Knowledge sharing (transfer/ flows) is examined at both the intraorganisational and interorganisational levels (van Wijk et al. 2008), with the latter including at least two organisations (Easterby-Smith et al. 2008). In this regard, knowledge sharing relations are examined in buyer-supplier relationships (Lawson et al. 2009), business units of multiunit companies (Tsai 2002; Hansen 2002) and affiliated firms of business groups (Lee et al. 2010; Lee and MacMillan 2008). A similar problem about the level of analysis may be observed when analysing social capital as well. Whilst individual social capital originates from an individual’s network of relationships and is distinguished from organisational capital, which is derived from an organisation’s network of relationships, it is contended that the two levels of capital are interrelated (Inkpen and Tsang 2005; Gulati 1998). For this study, the firm is the unit of analysis and the data related to firm innovation is collected at that level. The knowledge sharing activities and social capital are evaluated at the firm-to-firm level.

In addition, affiliated firms are compared to independent ones. The former, are legally independent and have their own government systems similar to independent firms, therefore, this makes them empirically comparable to independent ones (Belenzon and Berkovitz 2010). Despite the boundaries of business groups often being

fuzzy or uncertain, the distinction between insiders and outsiders is an important part of the group concept (Borgatti and Halgin 2011). Boyd and Hoskisson (2010) consider the links of affiliated firms to non-affiliated ones and raise an important issue regarding the use of knowledge from outside of the former. Distinguishing group insiders from outsiders helps us to understand whether group affiliates that have connections outside the group boundaries provide firms with information (Khanna and Rivkin 2006). Since this study includes group affiliated and independent firms, this distinction is clarified in the questionnaire. Three kinds of relationships are defined, with the first being that group affiliated firms have them with other affiliates (buyers and suppliers) within their groups. The second pertains to the relationships that affiliates have with independent firms (with the firms that are outside the group), whilst the last refers to the relationships that independent firms have with other independent ones.

### **3.2.3 Research Sample and Data Resources**

For this study, the top 500 and second 500 largest manufacturing firms are used as the sample. Similar kinds of list are used in the literature to compare the innovativeness of affiliated and independent firms in Korea and Taiwan (Chang et al. 2006), to examine the professionalisation of boards (Oktem and Usdiken 2010) and to identify the antecedents of top management teams (Yamak and Usdiken 2006) in Turkish business group affiliated and independent firms. Istanbul Chamber of Industry (ICI) publishes Turkey's first and second 500 largest firms annually. Both lists used in this study belong to the year 2011. The data on business group firm affiliation is not readily available in Turkey and consequently, the initial affiliation information is gathered through visiting each firm's web page for both lists.

### **3.2.4 Research Method and Data Collection**

Firm level cross-sectional data related to knowledge sharing activities, social capital and innovation of the firms were collected through an online survey. Similar studies have adopted the same procedure (Im and Rai 2008, Lawson et al. 2009). The targeted respondents consisted of general (or middle/ senior) managers and senior executives (or whomever he/she appointed) at decision-making levels (Villena et al. 2011). To ensure reliable responses, respondents were promised that their personal

identification (except their position) was not required and firm names would not be shared in this research. In addition, the respondents were offered a summary of the key findings.

Hoskisson et al. (2000) point out several data collection problems in relation to emerging economies. For instance, one of the difficulties experienced by respondents occurs in understanding terms and concepts familiar to managers in developed market economies. In order to decrease the likelihood of this being a problem, a set of questions was developed in English and translated into Turkish by a native speaker. Then, the Turkish version was translated back into English to ensure validity. Also, to alleviate possible social desirability bias, all the respondents were informed of the academic purpose of the study and the confidentiality of their responses (Li et al. 2008a).

Conducting a pilot study is a common method before the administration of the final version of a questionnaire. For instance, Yli-Renko et al. (2000) pre-tested the study's questionnaire with ten firms' executives to ensure that no problems existed in the terminology and interpretability of questions. Villena et al. (2011) validated the survey through a pre-test with four academics and five managers in order to improve wording, design and administration. McEvily and Marcus (2005) pre-tested the survey instrument with 22 executives before the final questionnaire and incorporated the feedback into the revised version along with comments and suggestions from industry experts and colleagues. Li et al. (2008a) conducted a pilot study with 30 senior managers to provide feedback about the questionnaire's design and wording. In order to ensure content and face validity of the measures and to provide feedback on the design as well as clarity of the questions and wording, a draft questionnaire was sent to six academics and appropriate revisions were made as a result of this feedback. Also, face-to-face discussions were held with three managers (not included in the final sample) to evaluate the effectiveness of the questionnaire (Lawson et al. 2008; 2009). Regarding which, the term knowledge sharing with 'other firms' was clarified as knowledge sharing with 'buyers and suppliers' as a result of feedback from one manager in the automotive industry.



In addition, whilst the questions were the same, two different questionnaires were prepared for the affiliated and independent firms, as the design of the questionnaire was not clear. In contrast to the questionnaire for the independent firms, in that for the group affiliated firms, there were two different sections to capture the knowledge sharing and social capital of affiliated firms with both group affiliates and non-affiliates. The same relationships that independent firms have with other firms are enquired about in one section in the questionnaire prepared for those firms. The questionnaires for affiliated and non-affiliated firms can be found in Appendix 3.1 and Appendix 3.2, respectively. Before sending the questionnaire, firms were called and affiliation information was confirmed. The respondents were asked to clarify their firms' membership with a business group (holding) and then the relevant questionnaire was sent to each firm. A Likert scale is one of the most widely used instruments for measuring opinion, preference and attitude. It consists of a number of items with around 4 to 7 points or categories each and can be collapsed into condensed categories. Analysis can be based on individual items or a summation of items forming a scale (Leung 2011). In this study the items are measured on a scale from 1 to 5.

In total, 946 firms were in the first and second 500 firm lists. 54 firms were not listed, because they did not provide the minimum requirement (i.e. financial figures) to be included in lists. 22 of them were excluded from the research, because the firms defined themselves as the manufacturers for the military and other industries, which raised privacy issues. The rest of the firms were contacted by phone and email, whilst the questionnaires were sent by email. Of the contacted 924 firms (321 affiliated, 603 independent), 661 firms agreed to receive the questionnaire. In order to achieve a higher response rate, reminder emails were sent at four and then six weeks after the initial mailing. In total, 131 firms responded; 128 of them were valid (three of them were eliminated because of the missing data), which corresponded to a usable response rate of 19% (14% of all the firms contacted). The number of usable responses for group affiliated and independent firms was equal (N=64).

### **3.2.5 Ethical Considerations**

Research in social science brings responsibilities in terms of protecting the rights of individuals and firms during data collection and throughout the other stages.

Specifically, during quantitative research protecting the privacy of the individual before and after a questionnaire survey and using the data within the limits of the official bodies are important matters of ethical dimensions. On the other hand, qualitative research requires different precautions in terms of the methods chosen to carry out the research (Bulmer 2008). If the quantitative data are available for the analysis through governmental bodies, firms' annual reports, web pages, this situation provides a safeguard to some extent (Bulmer 2008). However, since this study is based on a survey, the permission for carrying out the research had to be requested from the relevant departments in the firms and all respondents were informed of the confidentiality of their contributions. Moreover, this research complies with the ethical guidelines, which are defined in the University of Bath's 'Code of Good Practice in Research Integrity'. A student and a supervisor letter were sent with the questionnaire to ensure confidentiality. The data collected from this research was kept securely in a password protected environment.

### **3.3 Variables and Measurement Model Assessment**

The variables used in empirical chapters are presented in Table 3.1 along with the measurement items. Regarding the first, the variables are performance, innovation, tacit and explicit knowledge sharing, absorptive capacity, institutional support, organisational capital, holding-affiliate knowledge flows and autonomy along with business group affiliation. For the second empirical chapter, which examines the social capital, knowledge sharing and business group affiliation relations, the dependent variable is knowledge sharing and the independent variables are business group affiliation and the three dimensions of social capital, namely: social interaction, trust and shared vision. For the third, which examines knowledge sharing, innovation and business group affiliation relations, the dependent variable is innovation and the independent variables are explorative and exploitative knowledge sharing along with business group affiliation. A detailed explanation regarding variable measurement is provided in chapters four, five and six. In order to develop the dependent and independent variables, when possible, existing measures are drawn upon from the previous literature and some cases modified.

**Table 3.1 Variables and Measurement Items**

<b>Variables</b>	<b>Measurement Items</b>	<b>Survey</b>	<b>Source</b>
<b>Business group affiliation</b>	<p><b>Is your firm affiliated with a Turkish holding/ business group?</b></p> <p>a) Yes b) No</p> <p><b>(Dummy variable 1=Yes, 0=No)</b></p>	<p>Q.1 (Affiliated and Nonaffiliated)</p> <p><b>Chapters 4, 5, 6</b></p>	(Firms, survey)
<b>Performance</b>	<p><b>Please evaluate your firm's average overall performance relative to the other firms in your industry (sector) over the last 2 years.</b></p> <p>-Return on Sales -Return on Assets -Return on Investment -Profit Growth -Sales Growth -Market Share Growth</p> <p><b>(1=Much worse to 5=Much better)</b></p>	<p>Q.10 (Affiliated and Nonaffiliated)</p> <p><b>Chapter 4</b></p>	De Clercq et al. (2010); Acquaah (2012)
<b>Innovation</b>	<p><b>Please indicate the extent to which your firm has introduced product and/ or process innovations over the last 3 years.</b></p> <p>- Introduction of new product lines <b>(Product)</b> - Changes/ improvements to existing product lines <b>(Product)</b> - Introduction of new equipment/ technology in the production process <b>(Process)</b> - Introduction of new input materials in the production process <b>(Process)</b> - Introduction of organisational changes/ improvements made in the production process <b>(Process)</b></p> <p><b>(1= Not at all to 5=A Great Extent)</b></p>	<p>Q.7 (Affiliated and Nonaffiliated)</p> <p><b>Chapters 4, 6</b></p>	Molina-Morales and Martinez-Fernandez (2009); Tomlinson (2010)

<p><b>Knowledge sharing</b></p> <p><b>(Explorative-Exploitative)</b></p>	<p>The following statements relate to your firm's knowledge sharing on products with other firms over the last 5 years. Please indicate the level of your agreement. (Items are repeated for suppliers and buyers in the questionnaire.)</p> <p><b>Explorative</b></p> <ul style="list-style-type: none"> <li>- We liaise and share knowledge in the development of new products (<b>Explorative</b>)</li> <li>- We share knowledge on extending the product range (<b>Explorative</b>)</li> <li>- We share knowledge on entering new technology fields (<b>Explorative</b>)</li> </ul> <p><b>Exploitative</b></p> <ul style="list-style-type: none"> <li>- We share knowledge on improving existing product quality (<b>Exploitative</b>)</li> <li>- We share knowledge on improving production flexibility (<b>Exploitative</b>)</li> <li>- We share knowledge on reducing production costs (<b>Exploitative</b>)</li> </ul> <p>(1=Strongly disagree to 5=Strongly agree)</p>	<p>Q.17, Q.16 (Affiliated and Nonaffiliated, respectively)</p> <p><b>Chapter 6</b></p>	<p>He and Wong (2004); Lee et al. (2010)</p>
<p><b>Knowledge sharing</b></p> <p><b>(Tacit-Explicit)</b></p>	<p>The following statements relate to your firm's knowledge sharing on managerial and manufacturing processes with other firms over the last 5 years. Please indicate the level of your agreement. (Items are repeated for suppliers and buyers in the questionnaire.)</p> <p><b>Tacit:</b></p> <ul style="list-style-type: none"> <li>- We share knowledge on market trends and opportunities (<b>Tacit</b>)</li> <li>- We share knowledge on managerial techniques (<b>Tacit</b>)</li> <li>- We share knowledge on management systems and practices (<b>Tacit</b>)</li> </ul> <p><b>Explicit:</b></p> <ul style="list-style-type: none"> <li>- We share knowledge associated with product designs (<b>Explicit</b>)</li> <li>- We share knowledge associated with manufacturing and process designs (<b>Explicit</b>)</li> <li>- We share knowledge on the technical aspects of products (<b>Explicit</b>)</li> </ul> <p>(1=Strongly disagree to 5=Strongly agree)</p>	<p>Q.15, Q.14 (Affiliated and Nonaffiliated, respectively)</p> <p><b>Chapters 4, 5</b></p>	<p>Maurer et al. (2011); Lane et al. (2001); Dhanaraj et al. (2004); Becerra et al. (2008); Schulz (2003)</p> <p>Gupta and Govindarajan (2000)</p>

<b>Social interaction</b>	<p><b>The following statements relate to your firm's social relationships with firms over the last 5 years. Please indicate the level of your agreement. (Items are repeated for suppliers and buyers in the questionnaire.)</b></p> <ul style="list-style-type: none"> <li>- Our middle and senior level managers spend a considerable amount of time on social events with suppliers/ buyers</li> <li>- There is no intensive network between our firm and suppliers/ buyers <b>(R)</b></li> <li>- Our middle and senior level managers spend a considerable amount of time on business related events (training, seminars etc.) with suppliers/ buyers</li> </ul> <p><b>(1=Strongly disagree to 5=Strongly agree) (R: Reverse coded)</b></p>	<p>Q.18, Q.15 (Affiliated and Nonaffiliated, respectively)</p> <p><b>Chapters 4, 5</b></p>	<p>Molina-Morales and Martinez-Fernandez (2009); Laursen et al. (2012)</p>
<b>Trust</b>	<p><b>The following statements relate to your firm's relationships with other firms. Please indicate the level of your agreement. (Items are repeated for suppliers and buyers in the questionnaire.)</b></p> <ul style="list-style-type: none"> <li>- You never have the feeling of being misled in business relationships with suppliers/ buyers</li> <li>- Until they prove that they are trustworthy in business relationships you remain cautious when dealing with suppliers/ buyers <b>(R)</b></li> <li>- You cover everything with detailed contracts while dealing with suppliers/ buyers <b>(R)</b></li> <li>- You get a better impression the longer the relationships you have with suppliers/ buyers</li> </ul> <p><b>(1=Strongly disagree to 5=Strongly agree) (R: Reverse coded)</b></p>	<p>Q.19, Q.17 (Affiliated and Nonaffiliated, respectively)</p> <p><b>Chapters 4, 5</b></p>	<p>Gaur et al. (2011)</p>
<b>Shared vision</b>	<p><b>The following statements compare your firm's vision with those of other firms. Please indicate the level of your agreement. (Items are repeated for suppliers and buyers in the questionnaire.)</b></p> <ul style="list-style-type: none"> <li>- Your firm shares the same vision as your suppliers/ buyers</li> <li>- Your firm does not share similar approaches to business dealings as your suppliers/ buyers <b>(R)</b></li> <li>- Your firm shares compatible goals and objectives with suppliers/ buyers</li> <li>- Your firm does not share similar corporate culture/ values and management style as your suppliers/ buyers <b>(R)</b></li> </ul> <p><b>(1=Strongly disagree to 5=Strongly agree)</b></p>	<p>Q.20, Q.18 (Affiliated and Nonaffiliated, respectively)</p> <p><b>Chapter 5</b></p>	<p>Villena et al. (2011)</p>

<b>Absorptive capacity</b>	<p><b>The following statements relate to the value of new knowledge. Please indicate the level of your agreement.</b></p> <ul style="list-style-type: none"> <li>- We are able to identify and absorb external knowledge from other firms</li> <li>- We can successfully integrate existing knowledge with new knowledge acquired from other firms</li> <li>- We can successfully exploit the new integrated knowledge into concrete applications</li> </ul> <p><b>(1=Strongly disagree to 5=Strongly agree)</b></p>	<p>Q.14, Q.13 (Affiliated and Nonaffiliated, respectively)</p> <p><b>Chapter 4</b></p>	<p>Ettlie and Pavlou (2006)</p>
<b>Institutional support</b>	<p><b>The following statements explore the support your firm receives from other firms and institutions. Please indicate the level of your agreement.</b></p> <ul style="list-style-type: none"> <li>-Your firm has received support for Research and Development (R&amp;D) activities from other firms and/ or institutions</li> <li>-You and/ or your employees have received specific business related training by other firms and/ or institutions</li> <li>-Your firm has received benefits from research activities carried out by other firms and/ or institutions</li> </ul> <p><b>(1=Strongly disagree to 5=Strongly agree)</b></p>	<p>Q.26, Q.20 (Affiliated and Nonaffiliated, respectively)</p> <p><b>Chapter 4</b></p>	<p>Molina-Morales and Martinez-Fernandez (2004); Tomlinson and Jackson (2013)</p>
<b>Organisational capital</b>	<p><b>The following statements relate to you firm's knowledge storage. Please indicate the level of your agreement.</b></p> <ul style="list-style-type: none"> <li>- Much of our organisation's knowledge is contained in manuals, databases, etc.</li> <li>- Our organisation uses patents and licences as a way to store knowledge.</li> <li>- Our organisation embeds much of its knowledge in structures, systems and processes</li> <li>- Our organisation's culture (stories, rituals) contains valuable ideas, ways of doing business, etc.</li> </ul> <p><b>(1=Strongly disagree to 5=Strongly agree)</b></p>	<p>Q.25, Q.19 (Affiliated and Nonaffiliated, respectively)</p> <p><b>Chapter 4</b></p>	<p>Subramaniam and Youndt (2005)</p>

<b>Holding-Affiliate knowledge flows</b>  <b>(Group firms only)</b>	<p><b>Please indicate the extent to which the holding company has provided your firm with knowledge on the following items over the last 5 years. (The term ‘holding company’ refers to the company at the top.)</b></p> <ul style="list-style-type: none"> <li>- Knowledge about technology</li> <li>- Knowledge about sales and marketing</li> <li>- Knowledge about competitor and supplier strategies</li> </ul> <p><b>(1= Not at all to 5=A great extent)</b></p>	<p>Q.16 (Affiliated only)</p> <p><b>Chapter 4</b></p>	<p>Schulz (2001; 2003)</p>
<b>The degree of autonomy</b>  <b>(Group firms only)</b>	<p><b>Please indicate below which category best describes the decision making authority that your firm has in terms of the following areas. (The term ‘holding company’ refers to the company at the top.)</b></p> <ul style="list-style-type: none"> <li>- Product range</li> <li>- Research and Development</li> <li>- Marketing</li> <li>- Production capacity</li> <li>- Manufacturing technology</li> <li>- General management</li> </ul> <p><b>(1) By the holding company without consulting your firm; (2) By the holding company after consulting your firm; (3) Equal influence in decision making (4) By your firm after consulting with the holding company; (5) By your firm without consulting with the holding company</b></p>	<p>Q.13 (Affiliated only)</p> <p><b>Chapter 4</b></p>	<p>Taggart (1998)</p>
<b>Internationalisation</b>	<p><b>Does your firm engage in business in other countries (e.g. foreign direct investment, export activities etc.)?</b></p> <p>a) Yes b) No</p> <p><b>If YES please indicate below (please tick if both apply):</b></p> <p>a) Export    b) Foreign direct investment</p>	<p>Q.5 (Affiliated and Nonaffiliated)</p> <p><b>Chapter 4</b></p>	<p>Survey</p>

<b>Firm age</b>	<b>In which year was your firm established?</b>	Q.3 (Affiliated and Nonaffiliated)  <b>Chapters 5, 6</b>	Survey
<b>Firm size</b>	<b>How many employees are there in your firm?</b>  a) Less than 50 b) 50-99 c) 100-149 d) 150-249 e) 250-499 f) 500-999 g) 1000-1999 h) 2000-4999 i) 5000-9999 j) 10000 or more	Q.4 (Affiliated and Nonaffiliated)  <b>Chapters 4, 5, 6</b>	Survey
<b>Industry</b>	<b>What is your firm's main sector?</b> (Three-digit ISIC codes)	Q.6 (Affiliated and Nonaffiliated)  <b>Chapters 4, 5, 6</b>	Survey, ICI
<b>R&amp;D</b>	<b>Approximately what proportion of your firm's turnover (either direct budget or staff time) was spent on Research or Development activities (e.g. product, process, or design activities conducted either in-house or in collaboration) over the period 2008-2013?</b>  a) 0-20 % b) 21-40% c) 41-60% d) 61-80% e) 81-100%	Q.11 (Affiliated and Nonaffiliated)  <b>Chapters 4, 5, 6</b>	Tomlinson (2010)
<b>Corporate social responsibility (CSR)</b>  <b>(CMV Marker Variable)</b>	<b>The following statements focus on your firm's corporate social responsibility. Please indicate the level of your agreement.</b>  -The socially responsible manager must place the interests of the society over the interest of the firm -The fact that corporations have great economic power in our society means that they have a social responsibility beyond the interests of their shareholders - As long as corporations generate acceptable shareholder returns, managers have a social responsibility beyond the interests of shareholders  <b>(1=Strongly disagree to 5=Strongly agree)</b>	Q.27, Q.21 (Affiliated and Nonaffiliated, respectively)  <b>Chapter 6</b>	Vitell and Davis (1990)



Validity of the measurement model and the reliability of the variables are assessed through several analyses. Validity is the extent to which a measure or a set of measures correctly represents the concept of the study (Hair et al. 2010) and there are four types: internal, external, construct (convergent and discriminant) and conclusion validity. Internal validity is related to causality, whereby a causal relationship among variables can be maintained if there is true co-variation between the variables and the cause precedes the effect that alternative relations are eliminated (Scandura and Williams 2000). External validity refers to the ability to generalise the causal relationship to different settings (Calder et al. 1982), whilst construct validity reflects whether the measures chosen are true constructs describing the event (Straub 1989). If constructs are valid, high correlations are expected between measures of the same construct and low ones are expected between measures of different constructs (Straub 1989). Conclusion validity refers to the ability to draw conclusions with statistical covariation and prediction (Scandura and Williams 2000).

Construct validity includes convergent and discriminant validity of the variables and can be evaluated through confirmatory and exploratory factor analyses (Scandura and Williams 2000). Convergent validity pertains to the *“degree to which multiple attempts to measure the same concept are in agreement. The idea is that two or more measures of the same thing should covary highly if they are valid measures of the concept”* (Bagozzi et al. 1991, p.425). According to Anderson and Gerbing (1988, p.416), convergent validity can be tested with a measurement model by examining whether *“each indicator’s estimated pattern coefficient on its posited underlying construct is significant (greater than twice its standard error)”*. Discriminant validity is the *“degree to which measures of different concepts are distinct. The notion is that if two or more concepts are unique, then valid measures of each should not correlate too highly”* (Bagozzi et al. 1991, p.425). Reliability is an assessment of the degree of consistency between multiple measurements of a variable (Hair et al. 2010). Composite reliabilities can be calculated from factor loadings and measurement error with confirmatory factor analysis (Gefen et al. 2000). Reliability can also be assessed by calculating the coefficients with the Cronbach’s alpha measure (Hair et al. 2010).

In his study, all the analyses related to measurement model were conducted with Stata (V14.2). In order to assess the convergent validity, first, a principal

component factor analysis (PCF) was used. To examine the convergent validity further, a confirmatory factor analysis (CFA) was conducted within structural equation modelling by examining the factor loadings of each variable. Discriminant validity of the constructs was assessed based on the comparison of the average variance extracted (AVE) and the squared correlations between the variables. Composite reliabilities of the variables were calculated with confirmatory factor analysis. The reliabilities were also calculated with Cronbach's alpha and the detail relating to the analyses are presented in chapters four, five and six.

### **3.4 Common Method Variance**

Common method variance (CMV) is an “*artifact of measurement that biases results when relations are explored among constructs measured by the same method*” (Spector 1987, p.438) and is “*attributable to the measurement method rather than to the constructs the measures represent*” (Podsakoff et al. 2003, p.879). CMV occurs when measures of two or more variables are collected from the same respondents (Podsakoff and Organ 1986) and happens because of the consistency motif, implicit theories and illusory correlations, social desirability and leniency biases (Podsakoff et al. 2003). One of the effects of CMV is that method factors can bias estimates of construct reliability and validity (Podsakoff et al. 2012). Also, CMV can bias parameter estimates of the relationship between two different constructs.

Podsakoff and Organ (1986) propose the design of the study's procedures and statistical controls as the two primary ways of controlling for method biases. One of the ways of reducing the CMV problem is using different sources of information for some of the key measures, such as the dependent variables (Podsakoff and Organ 1986; Chang et al. 2010). Also, collecting information for the independent variables from multiple respondents within the same firm may alleviate the CMV problem. Another way of overcoming it pertains altering the design and administration of the questionnaire, such as mixing the order of the questions and using different scale types (Chang et al. 2010). Lindell and Whitney (2001) suggest including a scale (marker variable) that is theoretically unrelated to at least one other variable in the questionnaire and state that this variable provides discriminant validity to the design.

In addition to above methods, there are several statistical remedies for overcoming CMV problems.

1. To check whether there is a CMV problem, Harman's one factor (single factor) test can be performed as a statistical control (Podsakoff et al. 2003). This method loads all items from each of the constructs into an exploratory factor analysis to see whether one single factor does emerge or whether one general factor does account for a majority of the covariance between the measures; if not, the claim is that CMV is not a problem (Chang et al. 2010). However, Podsakoff et al. (2003) state that Harman's test is insensitive.

2. Multitrait-multimethod (MTMM) procedure is another way of detecting CMV (Campbell and Fiske 1959), for which each of the variables and measures of multiple traits are measured using multiple methods (Podsakoff et al. 2003; Malhotra et al. 2006). Then, a MTMM matrix is created, which is a table of correlations among the combinations of traits and methods (Malhotra et al. 2006). CMV exists, if the average MH (monomethod-heterotrait) correlation is considerably greater than the average HH (heteromethod-heterotrait) correlation (Malhotra et al. 2006).

3. Lindell and Whitney (2001) state that a partial correlation analysis can be used to detect the presence of CMV and is called the 'correlational marker technique' in which CMV is controlled by "*partialling out shared variance in bivariate correlations associated with a particular covariate*" (Richardson et al. 2009, p.767). With this method, the observed correlations for CMV are adjusted and whether the significance of the predictor is affected by CMV is determined. The best estimate of CMV is the "*smallest observed positive correlation between the marker variable and a substantive variable*" (Richardson et al. 2009, p.767). If the marker variable is correlated to one of the substantive variables, this could be because they have something in common and theoretically, should be unrelated (Richardson et al. 2009; Williams et al. 2010).

4. Another statistical technique for detecting CMV is the confirmatory factor analysis marker technique (Richardson et al. 2009). Structural equation modelling is used to conduct a confirmatory factor analysis with marker variables (Williams et al.

2010). When there is a variance shared between the marker and the other substantive constructs, then CMV is present. In order to test for CMV statistically, the fit of a model in which the marker construct-substantive item loadings are estimated is compared to that of a model in which they are constrained to zero (Richardson et al. 2009).

In this study, in order to mitigate for the CMV problem respondents were assured of the anonymity and confidentiality of the study, that there were no right or wrong answers and that they should answer as honestly as possible. Additionally, the questionnaire and individual items were formulated as concisely as possible (Chang et al. 2010). Also, the potential for common method problems may be reduced by employing previously validated measures (Spector 1987). Also, in addition to Harman's one factor test (Podsakoff and Organ 1986), a confirmatory factor analysis marker technique was used to detect CMV. Lindell and Whitney (2001) suggest marker variable (MV) analysis when researchers assess correlations that have been identified as being most vulnerable to it. Moreover, Podsakoff and Organ (1986) recommend structural equation modelling techniques in order to detect CMV. Consequently, in this study, a confirmatory factor analysis marker technique, as recommended by several researchers (Richardson et al. 2009; Malhotra et al. 2006), was conducted. Corporate social responsibility (CSR) was used as a theoretically unrelated marker variable and it was measured by three items following Vitell and Davis (1990), which are stated in Table 3.1. The comparison models used in this technique are explained below.

**CFA model (Unstandardised):** All variables loaded onto their corresponding items and the marker variable loaded onto its corresponding items. (The factor loadings linking the marker variable to other variable items were fixed to 0.) All correlations among the marker variable and other variables were estimated.

**Baseline Model (Unstandardised):** The correlations between the marker variable and other variables were set to 0. The item loadings and error variances of the marker variable were fixed to the -unstandardised- values obtained from the CFA model above. The loadings from the marker variable to other variable items were fixed to 0 (or the marker variable was not connected to other variable items).

**Method-C Model (Constrained):** This model is similar to the Baseline Model and includes the loadings from the marker variable to other variable items, constraining them to having equal values. A comparison of the Method-C Model to the Baseline Model provides a test of the presence of equal method effects associated with the marker variable.

**Method-U Model (Unconstrained):** This model is similar to the Method-C Model and includes the loadings from the marker variable to other variable items being freely estimated (allows them to be different from each other). A comparison of the Method-C and Method-U Models provides a test of the key difference between the CMV and unrestricted method variance (UMV) models and the assumption of equal method effects (Williams et al. 2010).

**Method-R Model (Restricted):** This model is identical to the Method-C and Method-U models with the difference being that of constraining the variable correlations (only correlation of variables other than marker variable) to the values obtained from the Baseline Model. This model is necessary for investigating the potential biasing effect of the marker variable method variance on factor correlations (or structural parameters). The comparison of the Method-R Model with either the Method-C or Method-U Models (depending on which is retained in their direct comparison) provides a test of the bias in the substantive factor correlations due to the marker-based method variance that may be present.

### **3.5 Nonresponse Bias**

In survey research, a difference between respondents and nonrespondents may cause nonresponse bias. Late respondents are supposed to be similar to nonrespondents (Armstrong and Overton 1977). Consequently, to test for nonresponse bias, a t-test was conducted on the mean differences between early and late respondents with regard to the variables used in this study. The details and results are presented in chapter five and chapter six.

## **Chapter 4 Characteristics of Turkish Business Groups: A Comparison of Affiliated and Independent Firms in Turkey**

### **4.1 Introduction**

In this chapter, several characteristics of Turkish business groups, including their emergence, ownership structure, diversification and internationalisation are introduced. After this introduction, the impact of business group affiliation on performance in various emerging economies is examined. Business group literature is well documented in terms of the impact of affiliation on performance (Khanna and Palepu 2000a; 2000b; Khanna and Rivkin 2001; Isobe et al. 2006; Seo et al. 2010; Bamiatzi et al. 2014; Chu 2004) and innovation (Chang et al. 2006; Hsieh et al. 2010; Belenzon and Berkovitz 2010; Castellacci 2015). However, the knowledge sharing (Lee et al. 2010; Lee and MacMillan 2008; Lee et al. 2016) and social capital (Yiu et al. 2003) impacts of affiliation have been examined to a lesser extent. Some of these studies also focused on just group firms, however, they did not make a distinction between within and outside group relations. Consequently, in order to enhance understanding of the group concept and affiliated firm behaviour within and outside the group, this chapter compares the group affiliated firms' relations with other affiliates and with firms outside the group in terms of social capital and tacit and explicit knowledge sharing. Also, with a further focus on group affiliated firms, the extent of knowledge flows from the company at the top (the holding company) to affiliated firms and their degree of autonomy in decision making regarding production, marketing and management are examined. Moreover, based on the review of the performance impact of affiliation in this chapter and the impact of group affiliation on innovation, which has been explained in chapter two, an empirical comparison between group affiliated and independent firms is presented in terms of both innovation and performance in the context of an emerging economy, Turkey. This comparison is further elaborated through an examination of absorptive capacity, institutional support and organisational capital, which can be related to both innovation and performance.

Taking into account the overall conceptualisation of this thesis, which has been explained in chapter two, this chapter provides several insights to the general theme.

First, it elaborates the group concept introduced in chapter two by explaining several characteristics of Turkish business groups and compares affiliated and independent firms. Second, an empirical comparison of group affiliated firms' within and outside group relations in terms of social capital, delivers understanding of the foundations of social capital and knowledge sharing relation as well as the moderation impact of affiliation on this relationship, both which are reviewed in chapter five. Third, a detailed analysis on group affiliated firms' knowledge sharing with sister affiliates and with firms outside the group provides initial insights into knowledge sharing and innovation relations, which are further investigated in chapter six. This chapter addresses an important gap in the literature about business groups by focusing on group affiliated firms' within and outside group knowledge exchange and social capital relations as well as the extent of holding-affiliate knowledge flows and affiliated firm autonomy. Lastly, it compares affiliated and independent firms in terms of innovation and performance.

## **4.2 Turkish Business Groups**

In developing economies, business groups have emerged due to the information asymmetries and inefficiencies in the financial, product and labour markets. Groups function as internal markets, where there are no well-functioning markets to rely on (Khanna and Palepu 2000a; 2000b; Chang and Choi 1988). In Turkey, business groups emerged after the Second World War (Ozkara et al. 2008). However, because some large firms were operating before the establishment of the Turkish Republic in 1923, old and prominent groups had their origins in the 1920s and the early 1930s (Bugra 1994; Colpan 2010). The liberalisation period in the 1980s provided growth and development opportunities for established groups and allowed the foundation of new groups (Karademir and Danisman 2007). Older groups that were established before the 1980s have had a strong influence on the national economy. Newly emerged groups after the liberalisation enjoyed high growth rates, although they tend to be smaller than the old established business groups (Karademir and Danisman 2007). The aims of the liberalisation period were to reduce state intervention and involvement in production activities, support export-led growth and to increase inward foreign direct investment (Goksen and Usdiken 2001). In particular, with the increase of private sector activities in business systems in the 1950s, the family business groups emerged rapidly

compared to 1920s and 1930s (Ozkara et al. 2008; Goksen and Usdiken 2001). Consequently, after the liberalisation period, domestic and international competition increased, with the private sector being dominated by large business groups (Gunduz and Tatoglu 2003).

Turkish business groups are defined as “*legally independent, privately held and publicly owned, companies operating in multiple industries, which are controlled through a top holding company with various equity and non-equity arrangements*” (Colpan 2010, p.495). The majority of the large scale firms in Turkey operate under a group and the business groups are mostly organised around a holding company (Gonenc et al. 2007; Yurtoglu 2000). In fact, groups in Turkey are generally called ‘holding’ and the group firms are legally independent companies, which have their own shareholders and boards (Gunduz and Tatoglu 2003). Business groups are, in the main, structured as pyramids with cross-shareholding between firms (Gonenc et al. 2007). In this structure, “*families hold the majority control of a holding company, which in turn has shareholdings in several other companies*” (Demirag and Serter 2003, p.42). The legally independent affiliates operate like units under a bureaucratised and administratively complex organisational structure (Yamak and Usdiken 2006). Also, state-business relations shape the characteristics of big business firms in Turkey (Yurtoglu 2000). Since the relationships between state and business groups are important, families on firm boards ensure the maintenance of close relationships with the former (Goksen and Oktem 2009).

In general, Turkish firms have concentrated and centralised ownership structures. The separation of ownership and control is achieved through the pyramidal ownership structures (Yurtoglu 2000; 2003) and business groups are mainly controlled by the founding family (Colpan 2010). This control is achieved either by a single family or a small number of families (Demirag and Serter 2003; Yurtoglu 2000). Families are the main decision making agents in strategic areas, whereas the other decisions are generally made by professional managers (Bugra 1994). The control of the operating affiliates is realised by the ‘holding’ company at the top of the group, which is a legally independent firm (Colpan 2010) and it is influential in the strategic decisions of affiliated firms. As in many business groups in emerging economies, cross-shareholding and interlocking directorates by the families are widely used to



control a large number of firms (Demirag and Serter 2003; Colpan 2010). Family members also have managerial positions on affiliated firms' boards, which are, in fact, dominated by the families, with outsiders and non-executive members having a much weaker role (Goksen and Oktem 2009). Boards appoint retired managers as independent outside directors, however, these are not fully independent due to their tenure in management positions (Goksen and Oktem 2009). The holding company governs the affiliates through ownership, a central management unit and joint directorships (Goksen and Usdiken 2001). Because family members are dominant in the management of groups (Goksen and Usdiken 2001; Colli and Colpan 2016), this reduces the agency problems which occur when the managers pursue interests that are inconsistent with those of the owners (Gunduz and Tatoglu 2003).

This family dominance has been examined in Turkish business groups. For instance, in a study of Turkish business groups, Goksen and Usdiken (2001) find that groups that were founded before and after the liberalisation period, do not differ in terms of family domination in ownership and the extent of professionalisation of top management. Another study by Usdiken and Oktem (2008) examines the configuration of affiliated firm boards within the framework of the corporate governance discourse in Turkey. Their findings show that whilst boards generally include non-executive directors, these are either members of the controlling family or have executive positions within the administrative structure of the group or affiliated firms and therefore, they are not considered as outsiders. Independent outside directors, who come from public sector or are involved in politics, rarely participate in boards. Further research by Goksen and Oktem (2009) on largest Turkish business groups, show that the percentage of outside directors did not increase between the period of 2002 and 2006. In addition, the board composition in terms of percentage of family members, retired managers and professional managers did not change over the same period.

Board professionalisation is examined in a different study by Oktem and Usdiken (2010). The authors investigate the antecedents of professionalisation on boards of business group affiliated firms in Turkey. Board professionalisation is operationalised by board size, ratio of salaried executives (total number of non-family managers divided by board size) and outsider directors (affiliated and non-affiliated). The results show a positive relationship between affiliated firm size, board size and

the presence of non-affiliated outside directors, whilst the ratio of salaried executives are lower in larger affiliated firms. Affiliated firms' internationalisation in terms of the operations in at least one country is associated with the presence of non-affiliated outsiders. The authors argue that the professionalisation of affiliated firm is related to institutional pressures and the presence of joint venture partners. Controlling families prefer not having salaried executives on the boards of firms, preferring to be sole managers wherever possible. Also, foreign firm involvement does not lead to a greater presence of salaried managers and outsiders.

Business groups in Turkey are also characterised by their diversification strategies (Colpan 2010). Large enterprises were supported by government due to the failures in product, capital and labour markets and they operated as multi-product firms (Bugra 1994; Colpan 2010). Also, state intervention and inconsistent policies encouraged large groups to pursue unrelated diversification (Bugra 1994; Colpan 2010). These diversification strategies in the 1980s were in response to these inconsistent policies (Bugra 1994). One of the main drivers of their diversification was government incentives which allowed Turkish firms to invest in underdeveloped, but high growth, potential industries (Yaprak et al. 2007). Turkish business groups have diversified across several industries, including food, electronics, automobiles, construction, chemicals, retailing and financial services (Gunduz and Tatoglu 2003). However, despite the groups being characterised as diversified entities, Karaevli (2008) argues that, recently, many Turkish business groups have started to implement 'multi-focus' diversification strategies. This means that they have been exiting from the industries that do not create competitive advantage and focusing on and entering into the selected number of industries that could provide them with this advantage.

Diversification strategies of Turkish business groups have been examined for different periods. For instance, in a study of Turkish business groups, Goksen and Usdiken (2001) show that groups founded after the liberalisation period (post-1980) did not differ from those that were established before then, in terms of diversification. Colpan and Hikino (2008), examining Turkish business groups that were established before and after the 1980s liberalisation period, reveal that groups showed no difference in their diversification patterns with regards to the different periods. However, Ozkara et al. (2008), in a study of Turkish business groups, find that business

groups that founded before the 1980s did differ from those set up after the liberalisation period in relation to their diversification strategies. That is, older groups diversified relatively more than the newly established ones. Karaevli and Yurtoglu (2012) examine the diversification patterns of the two largest business groups in Turkey between 1938 and 2010. According to their research, these groups remained unrelatedly diversified in response to the economic and institutional changes in their environment. The authors propose the groups' diversification as being 'multi-focus', which they defined as selecting a number of businesses to grow, exiting industries that are not profitable and entering new and more profitable sectors.

Business group affiliated firms may benefit through internationalisation. In line with the linkage, leverage, learning (LLL) paradigm, the linkages, leveraging resources and learning from other affiliates potentially provide affiliates advantages over independent firms (Yaprak and Karademir 2010; Tan and Meyer 2010). Turkish business groups, first, diversified into unrelated areas to reduce the risks associated with their home market and then, they expanded their activities to other countries. The uncertainty in economic and political environments and their over diversified nature prevented them from internationalising (Yaprak and Karademir 2010). Their initial internationalisation activities were a function of market opportunities outside of their home country, however, later, groups expanded their activities due to domestic political and economic instability and market opportunities in other countries (Yaprak and Karademir 2010). Regarding which, the Sabanci Group's alliance with Toyota, the Koc Group's partnership with Ford Motor Company, the Alarko Group's alliance with Carrier and the Anadolu Group's partnership with Isuzu are the examples of groups' internationalisation. Groups also outward internationalised through mergers and acquisitions. For instance, the Koc Group's acquisition of the Trolia, Sabanci Group's joint venture with DuPont and the Ulker Group's acquisition of Godiva, are the examples of groups' outward activities. Koc Holding and Sabanci Holding are the two largest groups that pursue acquisitions in developed and developing economies (Erdilek 2008). The drivers for Turkish groups' internationalisation are the outward oriented liberalisation of Turkish economy since the 1980s, the unstable environment, privatisation of state owned enterprises, financial complexities, such as tax regulations and access to external natural resources, markets, technologies and brands (Erdilek 2008; Yamak and Usdiken 2006). These liberalisation reforms included reducing state

intervention in economy, low exchange rate policy, increasing imports, encouraging foreign capital investment and deregulating the financial markets (Yaprak et al. 2007). Despite these reforms, Turkish groups enhanced their internationalisation activities in the early 1990s, because of the insufficient competitiveness of Turkish products (Colpan 2010).

However, because of several financial crises, foreign direct investment by multinationals remained low. Multinational companies preferred big Turkish business groups as an access point to an emerging market (Yaprak et al. 2007). In particular, after liberalisation new business groups played an important role in foreign firms' investment in Turkey and expanding Turkish firms' exports (Yaprak et al. 2007). For instance, in a study of Turkish business groups, Goksen and Usdiken (2001) reveal that groups, which were founded before the liberalisation period, have stronger export orientation than those established afterwards. On the other hand, groups that emerged in the post-1980 period engage in investment abroad. Ozkara et al. (2008), through a study of Turkish business groups, find that older groups founded before the 1980s, internationalise through partnerships with foreign firms in home country more than new ones established since. This is attributed to the experience of older groups in internationalisation and the operation of new ones in relatively fewer industries. The same study also shows that old and new business groups do not differ in terms of outward internationalisation.

Despite the formation of big business groups being attributed to state-business relationships, Colpan (2010) argues that Turkish business groups have competitive capabilities that can be applied to their own economic environments. The groups' strength depends on their financial capabilities and the quality of the people in the group. Their contact capabilities in sourcing of technology and information as well as project execution capabilities are the key elements of competitive advantage and survival. Colpan (2010) argues that relationships between the individual firms of Turkish business groups aim to achieve cooperation in the utilisation of financial resources, human and managerial resources and information resources. The relationships among affiliated firms, such as cooperation in the utilisation of various resources create advantages for the group and affiliated firms.

Turkish business groups typically were formed by gathering firms under umbrella of holding companies and establishing new firms affiliated to these holdings. Groups expanded their businesses through diversification and their diversification into related and unrelated areas of businesses was in the form of establishing new firms affiliated with groups. They generally followed an organic growth in the initial stages of their formation, however, in the later stages they also engaged in acquisitions. The following two Turkish business groups are the examples of how groups are formed in Turkey. The Koc Group was the first one established and most of the other firms followed similar formation patterns (Colpan and Jones 2016). The Koc family opened a grocery shop selling shoe rubber, sugar, olives and pasta in the 1917s. Then they entered into leather trading and hardware store business. They expanded the hardware business to textiles, glassware and other products. To respond the demand of new business opportunities, they entered the sale of construction materials and exited the grocery and leather business. During the 1920s, due to their reputation, they became the local agent when the automobile sales of foreign manufacturers started in Turkey. This was followed by the opening of an automotive assembly plant. During the 1940s and 1950s, they began to form joint ventures with foreign manufacturers and established an automobile assembly plant. In 1959, a white-goods manufacturer, Arcelik, was founded. After the increase of unrelated Koc companies, the family incorporated the companies within a headquarter company which was a management and monitoring centre. Then, this company was changed into a holding company which became the shareholder of the operating companies. During the 1960s Koc Group diversified into related and unrelated areas. Colpan and Jones (2016) also state that Koc Group used earnings from group companies to establish new companies in new businesses. The Group also established an R&D centre to support especially the automotive and industry subgroup firms in design, engineering, knowledge sharing and research. In addition, a Training and Development Centre was established to provide education for developing managers. Koc Group's main growth was through the establishment of new companies, however, the group also engaged in acquisitions, although to a lesser extent. Koc holding was the first holding in Turkey; Colpan and Jones (2016) state that other business groups followed the similar structure and foundation patterns.

Ercek and Guncavdi (2016) give an example of Elginkan Group. The Group started its activities as a family enterprise and then it became a business group. During 1950s, the founder with his brother established a construction company. Then, they founded a pressurised moulding company which produces metallic components. However, when this manufacturing company suffered from operating losses, the profits from contracting business helped this firm to continue its production. The capacity to produce prefabricated housing with metal work equipment triggered the establishment of a new factory to produce trailers and truck dampers. However, after 1965, the founder divested the contracting and trailer manufacturing companies, focusing only on the production of metallic components and established a raw materials company to produce required materials from the scrap metal. He was also inspired by the foundation of Koc Holding, therefore, he established a holding company in 1967 to control his existing companies. During 1970s, the Group diversified and established new factories in different cities and in 1980, a factory on ceramics is founded, a drug company was acquired but this drug company was sold in the 1990s. These achievements were followed by other large firms and owners as well.

The formation of Turkish business groups is similar to the formation of groups in other countries. Groups in other emerging economies were initially formed through diversifying existing businesses into related and unrelated areas by establishing new firms and by spin-offs, however, groups also grew through engaging in mergers and acquisitions. For instance, Korean business groups, utilised financial capital from existing firms in order to establish new affiliates (Kim 2010). In Taiwan, business groups were formed by establishing new subsidiaries (Chung and Mahmood 2010). However, they also engaged in mergers and acquisitions after the development of regulatory institutions and capital markets. Chinese business groups were formed through spin-offs and the establishment of new firms. Some of the groups engaged in mergers and acquisitions or joint ventures (Lee and Kang 2010). Indian groups were initiated by the families who were the source of finance for new ventures. These financial aid led to the ownership and control of the new ventures and a group of companies were gathered under direct and indirect the control of the families (Sarkar 2010). Brazilian business groups were founded as single firms, and then they established new companies to extend their activities into various industries. However, after liberalization and privatization some of these restructured themselves through

mergers and acquisitions (Aldrighi and Postali 2010). In Chile, the state firms, which are privatized, formed the basis for business groups (Lefort 2010). In Mexico, business groups were formed with the diversification of firms into related and unrelated areas and with the spin-off firms by the owner families. The established groups then, diversified their businesses further and restructured themselves with the acquisition of privatised companies (Hoshino 2010).

The use of acquisitions by business groups raises the issue of whether affiliation is an exogenous process or not. The exogeneity/ exogeneity of affiliation relates to where the power of decision making with respect to becoming an affiliated to a group, or not, lies during the formation of business groups. If business groups are formed by group owners through establishing new affiliates themselves in an organic way, then for the new firm, the decision to be affiliated with the business group is removed from their hands; the process of affiliation is said to be exogenous to the newly affiliated firm. Similarly, hostile takeovers of independent firms by business groups can describe the affiliation process as being exogenous as being an affiliate is not a voluntary decision. However, if a well performing pre-existing independent firm becomes a target for acquisition by a group and that firm chooses to become a member of a business group (Chang et al. 2006; Khanna and Palepu 2000a), then the process of affiliation can be said to be endogenous.

The research on business groups suggests that group members do not chose to be affiliated with a group, that is group affiliation is an exogenous process (Khanna and Palepu 2000a; Manikandan and Ramachandran 2015; Chang et al. 2006). This issue is examined in limited number of studies but generally found no evidence of endogeneity. For instance, Chang et al. (2006) state that in Korean and Taiwanese business groups markets for acquisition are weak. However, in some studies, the possible endogeneity of affiliation is assessed. Khanna and Palepu (2000b) restrict their analysis to the firms that had no change in group affiliation in Chilean business groups for a nine-year period. Their results show no evidence of endogeneity. Belenzon and Berkovitz (2010) restricted their sample on firms that had no change in affiliation status and used mergers and acquisitions database to examine changes in affiliation. Only 5% of firms showed change in ownership and these firms were dropped from the regression sample. Similarly, Manikandan and Ramachandran

(2015) argue that Indian groups restructured their businesses through acquisitions, selling their weak performing companies or consolidating similar businesses into a single firm after the economic liberalization. Therefore, to check for the possible endogeneity of affiliation, they repeated analysis on a restricted sample of firms that were not part of mergers and acquisitions activity. Their results show no evidence of endogeneity. In the present research, the cross-sectional nature of the data and the lack of a database on mergers and acquisitions limit the extent of assessing possible endogeneity of affiliation (Khanna and Yafeh 2010), however, in the empirical chapter which examines knowledge sharing, innovation and business group affiliation relations, the OLS and 2SLS regression results remained similar.

#### **4.3 The Impact of Business Group Affiliation on Firm Performance**

The general argument related to the impact of affiliation is that group firms perform and innovate better, because their internal capital markets provide them with the necessary resources when external capital markets for resources are inadequate. In emerging economies, business groups substitute inefficient markets and hence, affiliates may perform better than their independent peers (Gunduz and Tatoglu 2003; Khanna and Palepu 2000a; 2000b). The potential benefits of business group affiliation also stem from risk sharing through diversification (Gunduz and Tatoglu 2003). Group firms that operate in various industries reduce the risks associated with inefficient markets (Gunduz and Tatoglu 2003). However, the research on business groups shows mixed results, i.e. positive and negative effects, regarding the performance impacts of affiliation. Before discussing the literature on the performance impact of affiliation in Turkish business groups, the research on other countries is examined.

The research on performance impact of business group affiliation is inconclusive. For instance, Khanna and Palepu (2000a) compare the performance of business group affiliated firms with independent firms in India. The authors measure performance with Tobin's  $q$ ,  $(\text{market value of equity} + \text{book value of preferred stock} + \text{book value of debt} / \text{book value of assets})$  and return on assets (ROA). Group diversification is also considered and measured as the count of the number of industries in which the group is involved (categorised as least, intermediate and most diversified groups). The results show that firms affiliated with the most diversified groups (more



than seven industries) have greater Tobin's  $q$  than those unaffiliated. Firms affiliated with intermediate diversified groups have lower Tobin's  $q$  than unaffiliated firms, while the least diversified group firms do not differ from independent ones in terms of Tobin's  $q$ . Also, affiliates with intermediate diversified groups perform worse than unaffiliated ones in terms of ROA. These results suggest that affiliated firms' performance relative to independent firms differs across diversification categories. The study further investigates the relationship between performance and group membership. The results show that affiliated firms do not underperform unaffiliated ones, however, firms with the most diversified groups outperform independent ones in terms of Tobin's  $q$ . When the analysis is repeated with ROA, group membership has a negative impact on performance and firms affiliated with the least and intermediate diversified groups underperform unaffiliated ones. The overall results suggest that firms affiliated with the most diversified groups perform better in terms of Tobin's  $q$  than the other firms, that is, the most diversified groups add value by replicating the functions of inefficient institutions in an emerging economy.

A similar study was conducted by Khanna and Palepu (2000b) in Chilean business groups for the period between 1988 and 1996. While business group affiliation has a positive impact on return on assets after group diversification is controlled for in the early years, group diversification has a curvilinear impact. The authors reported that firms affiliated with extensively unrelated diversified groups outperformed unaffiliated firms in the early years of the sample. That is, the impact of unrelated diversification does not harm performance, contrary to the results on the performance and diversification research in developed economies. Considering diversification, Ferris et al. (2003) investigate Korean chaebols to determine the costs and benefits associated with business groups during the period of 1990-1995. The results show that such firms underperformed relative to independent ones, especially between 1992 and 1995. In addition, chaebols with a higher degree of related diversification suffered significantly less valuation discount than those with a lower degree of relatedness. The general argument related to these results are that chaebols pursue a profit stability strategy rather than profit maximisation, over-invest in low performing industries and cross-subsidise the weaker affiliates of the group.

In several studies, it is argued that moderating factors affect the group affiliation and performance relationship. For instance, Bamiatzi et al. (2014) examine the business group affiliation impact on sales growth in the U.K., an advanced economy. The results show a positive impact of group affiliation in declining industries, however, this impact varies depending on the firm size, group ownership type and group country of origin. The impact is higher for small firms, firms that are owned by a company and firms that are affiliated with both domestic and international groups. It is contended that business group impact is significant in advanced economies as well as emerging markets. Seo et al. (2010), in a comparison of group affiliated and independent Chinese firms for the period of 1994-2003, reveal that group affiliated firms initially performed well in terms of market valuation, but after 1995 their performance worsened compared to independent firms. The authors also examine several market (institutional development, competition) and firm level (unrelated diversification, agency costs, asset diversion) factors that may affect the performance impact of affiliation and elicit that such factors, in particular diversification and agency costs, can better explain the decrease in the performance of group firms. Another study by Ma et al. (2006) on Chinese firms shows a negative impact of affiliation and a positive interaction effect between group affiliation and state ownership on performance. The authors conclude that the benefits and costs of affiliation in emerging economies depend on the moderating factors. Zattoni et al. (2009) examine the impact of business group affiliation in India from 1990 to 2006. The findings show a positive impact of affiliation in the early phase of institutional transition, but not in the late phase. For only group affiliated firms, older firms performed better than younger ones and affiliated service firms did better than manufacturing firms.

Group size can also be an important explanatory factor in relation to different effects of affiliation on performance. For instance, Chu (2004) examines the effect of affiliation on ROA and Tobin's  $q$  in Taiwanese firms. When affiliated and independent firms are compared with a  $t$  test, independent firms outperform affiliated firms in terms of ROA, while there is no difference between these groups in terms of Tobin's  $q$ . After controlling for a number of variables, including firm size, diversification, market share, R&D and industry affiliation, the investigation of the relationship between group affiliation and firm performance shows an insignificant impact of affiliation on ROA. However, firms affiliated with smaller groups (top 31-100) significantly

underperform others. On the other hand, with regard to the Tobin's  $q$ , group affiliation has a positive impact and affiliation with the largest groups (top 30) improves affiliates' stock market outcome. Based on these results, it is argued that group affiliation cannot always create value for member firms and the size of the group matters. It is further contended that affiliation with a group reduces firms' flexibility and costs of affiliation may increase when firms engage in cross-subsidisation. Choi and Cowing (1999), based on a study of Korean firms for the period of 1985-1993, find that chaebol affiliated firms had significantly lower profit rates compared with independent ones up to 1989, but there was little difference after. Also, firms affiliated with the largest chaebols had higher growth rates and lower variation in annual profit rates. It is argued that this negative impact may have been as a result of their diversification and growth related goals.

Performance impacts of affiliation may differ across countries. For instance, Khanna and Rivkin (2001) investigate the performance (based on ROA) impact of group affiliation in 14 emerging economies. They find that group impact is positive in three countries (India, Indonesia, Taiwan) and the evidence is similar but weak for Israel, South Africa and Peru. On the other hand, the effect is negative for Argentina and a similar but weak result is observed in Chile and Philippines. The results for Brazil, Korea, Mexico, Thailand and Turkey suggest a balance between the costs and benefits of affiliation. The authors also find that in 12 countries, the returns of group affiliates are more similar to one another than those that are not members of the same group. Examining the impact of business group affiliation on firm performance in Indian and Chinese firms, Singh and Gaur (2009) discover that affiliated firms perform worse than independent firms. Moreover, this negative relationship is stronger for Indian firms than for Chinese ones. The authors argue that while business groups fill the institutional voids in emerging economies, the cost of affiliation may be more than benefits. Chacar and Vissa (2005) compare the firm performance in the U.S. and India during the period 1989-1999 and show that poor firm performance persisted longer in Indian than in U.S. firms. In addition, when only Indian firms are considered, firms that were affiliated with business groups or subsidiaries of foreign multinational corporations had a greater persistence of poor performance than those firms unaffiliated. The operationalisation of group membership may also have various impacts on performance differences. Regarding which, Isobe et al. (2006), examining

Japanese keiretsu membership on firm risk and return during the period of 1977-2000, show that keiretsu membership, which is measured by the presidents' council, equity ties and debt ties, had a negative impact on firm profitability, ROA and return on sales (ROS), whereas, the impact was positive when the performance is measured by the difference between the targeted and realised ROS.

Studies related to Turkish business groups are relatively scarce. In one of the few studies, Gonenc et al. (2007) examine the profitability of firms affiliated with diversified groups in Turkey and compare their performance with those of unaffiliated firms to reveal the role of internal capital markets within the group. The authors report that firms affiliated with a business group perform better than the independent ones in terms of operating return on assets, but not in terms of Tobin's  $q$ , a market value-driven measure. In addition, firms affiliated with intermediate (two to three industries) and the most diversified (more than four industries) business groups perform better than unaffiliated ones in terms of ROA. Another study by Gunduz and Tatoglu (2003) also compares the performance of business group affiliated firms with that of independent ones in Turkey. The results show that those affiliated with Turkish business groups do not differ significantly from unaffiliated firms in terms of accounting and stock market performance. Moreover, performance measures of family owned firms are not different from those of non-family owned firms. However, foreign owned firms perform significantly better than domestic firms in terms of return on assets.

These studies show that affiliated and independent firms differ in terms of performance, however, this difference depends on various moderating factors and the operationalisation of the performance measure. In general, affiliates are expected to perform better. In addition to the group affiliation and performance relationship, the impact of business group affiliation on innovation was elaborated upon in chapter two. Consequently, in the empirical section of this chapter, a comparison between affiliated and independent firms is given in terms of innovation as well as performance measures.

## 4.4 Methodology

The data for this chapter comes from the administered survey, full details of which were provided in chapter three and the next part explains the measurement of the variables related to this chapter. The measurement items related to variables were presented in Table 3.1 in chapter three (See chapter five for the measurement of the social capital variables).

### 4.4.1 Variables

**Business Group Affiliation:** To make a distinction between business group affiliated and independent firms a dummy variable is used, which has been utilised in similar studies to indicate business group affiliation (Belenzon and Berkovitz 2010; Chang et al. 2006; Chittoor et al. 2015) and industrial district affiliation (Molina-Morales and Martinez-Fernandez 2003; 2004; 2010). The initial questionnaire before the pilot study included all the sections relevant to affiliated and independent firms, however, since this was not clear for the respondents, two questionnaires were prepared, one for each type. The affiliation information was confirmed with respondents and then the relevant questionnaire was sent. The question, ‘Is your firm a part of business group (holding)’ was retained in both questionnaires for making a comparison between the initial confirmation and the respondents’ answers. Two questionnaires were dropped from the analysis since the affiliation information was not clear. Firms that belong to a group are coded as 1, whereas those that do not take a value of 0.

**Performance:** The overall performance is measured with six indicators: ‘return on sales, return on assets, return on investment, profit growth, sales growth and market share growth’, following De Clercq et al. (2010) and Acquaah (2012). Similar studies have used subjective measurement of firm performance (Govindarajan and Fisher 1990; Bae and Lawler 2000; Lee and McMillan 2008; Peng and Luo 2000; Tan and Peng 2003; Park and Luo 2001; Lee et al. 2010; Maurer et al. 2011). The respondents were asked to assess their firms’ performance relative to that of other firms in their industry during the past two years on a Likert scale ranging from 1= Much Worse to

5= Much Better. An overall measure for performance is calculated based on the average of the items. The Cronbach's alpha value for the performance variable is 0.94.

**Innovation:** Product innovation is measured with the items 'introduction of new product lines and changes/ improvements to existing product lines'. Process innovation is measured through 'introduction of new equipment/ technology in the production process, introduction of new input materials in the production process and introduction of organisational changes/ improvements made in the production process', following Molina-Morales and Martinez-Fernandez (2009) and Tomlinson (2010). The respondents were asked to assess their firms' innovation activities during the past three years on a Likert scale ranging from 1= Not at all to 5= A great extent. An overall measure for innovation is calculated based on the average of the product and process innovation items. The Cronbach's alpha value for the innovation variable is 0.86.

**Absorptive Capacity:** Absorptive capacity is defined as the ability to utilise external knowledge for innovation activities (Cohen and Levinthal 1990). It is suggested that absorptive capacity influences a firm's innovation and other outcomes (Zahra and George 2002). In order to assimilate and use new knowledge, firms need prior knowledge (Cohen and Levinthal 1990). Absorptive capacity is measured with the items 'identify, value and import external knowledge from other firms, integrate existing knowledge with new knowledge acquired from other firms and exploit the new integrated knowledge into concrete applications', following Ettlie and Pavlou (2006). The respondents were asked to assess their absorptive capacity on a Likert scale ranging from 1= Strongly disagree to 5= Strongly agree. An overall measure for absorptive capacity is calculated based on the average of the items. The Cronbach's alpha value for the absorptive capacity variable is 0.79.

**Institutional Support:** Institutions, such as universities, research institutes as well as trade and professional associations may provide firms with knowledge that facilitates innovation (Molina-Morales and Martinez-Fernandez 2004; Tomlinson and Jackson 2013). Institutional support is measured with the items 'firm has received support for R&D activities from other firms and/ or institutions, employees have received specific training by other firms and/ or institutions and firm has received

benefits from research activities carried out by other firms and/ or institutions', following Molina-Morales and Martinez-Fernandez (2004). The respondents were asked to assess institutional support on a Likert scale ranging from 1= Strongly disagree to 5= Strongly agree. An overall measure for institutional support is calculated based on the average of the items. The Cronbach's alpha value for the institutional support variable is 0.74.

**Organisational Capital:** The assets, specifically in the form of information and knowledge that firms accumulate, constitute organisational capital and affect firms' output (Prescott and Visscher 1980). Organisational capital is measured with the items 'knowledge is contained in manuals, databases, etc., using patents and licences as a way to store knowledge, embedding much of the knowledge in structures, systems, processes and organisation's culture (stories, rituals) contains valuable ideas and ways of doing business, etc.', following Subramaniam and Youndt (2005). The respondents were asked to assess their organisational capital on a Likert scale ranging from 1= Strongly disagree to 5= Strongly agree. An overall measure for organisational capital is calculated based on the average of the items. The Cronbach's alpha value for the organisational capital variable is 0.68.

**Tacit and Explicit Knowledge Sharing:** In the previous literature, the tacitness of knowledge is measured according to whether the knowledge transferred is written, well documented and with the type of knowledge being transferred (Hansen 1999; Hansen et al. 2005; Levin and Cross 2004). Another measurement is based on the complexity, codifiability and observability (Cavusgil et al. 2003). Some of the studies have emphasised the content of the knowledge that is being shared. These studies have included items, such as marketing expertise, managerial techniques, know-how and work expertise etc. (Becerra et al. 2008; Dhanaraj et al. 2004; Lane et al. 2001; Shenkar and Li 1999). On the other hand, explicit knowledge has been measured through sharing of manufacturing and production processes, knowledge about products, industry trends, procedural manuals etc. (Becerra et al. 2008; Dhanaraj et al. 2004; Lane et al. 2001).

However, it is difficult to define a widely accepted measure for tacit and explicit knowledge transfer or sharing (Becerra et al. 2008). Therefore, in this study, tacit and

explicit knowledge sharing items are developed based on earlier studies. Generally, the knowledge related to quantifiable technologies and processes are more explicit and more easily transferred (Dhanaraj et al. 2004). Technological knowledge sharing can be regarded as explicit, objectified knowledge, because it is related primarily, to product designs or specific manufacturing processes (Inkpen and Dinur 1998). Manufacturing and production process knowledge is much more explicit as it is codified in manuals and procedures (Lane et al. 2001). In contrast, managerial and marketing expertise is more tacit than product development, production and technology. Management and marketing skills are embedded and are not easily codified in formulas or manuals (Dhanaraj et al. 2004), hence they can represent tacit or embedded knowledge (Shenkar and Li 1999).

Based on these explanations in the literature, tacit knowledge sharing is measured through ‘sharing market trends and opportunities, managerial techniques and management systems and practices’. Explicit knowledge sharing is measured through knowledge ‘associated with product designs, knowledge associated with manufacturing and process designs and the technical aspects of products’. Knowledge sharing items are repeated for suppliers and buyers. The respondents were asked to assess their knowledge sharing activities during the past five years on a Likert scale ranging from 1= Strongly disagree to 5= Strongly agree. To measure each knowledge sharing variable, an average of all the items for suppliers and buyers is calculated. Also, for group affiliated firms, an average of all the items related to within group knowledge sharing and outside group knowledge sharing (tacit and explicit) is obtained. The Cronbach’s alpha values for the tacit and explicit knowledge sharing variables are 0.91 and 0.93, respectively.

**Holding-Affiliate Knowledge Flows (Group firms only):** The knowledge flows from the holding company to the affiliated firm is measured with the items ‘knowledge about technology, knowledge about sales and marketing and knowledge about competitor and supplier strategies’, following Schulz (2001; 2003). The term ‘holding’ refers to the company at the top. The respondents were asked to assess knowledge flows during the past five years on a Likert scale ranging from 1= Not at all to 5= A great extent. An overall measure for knowledge flows is calculated based on the average of the items. The Cronbach’s alpha value for the variable is 0.90.



**The Degree of Autonomy (Group firms only):** The degree of autonomy related to decision making of business group firms is measured following Taggart (1998). The items relate to ‘product range, research and development, marketing, production capacity, manufacturing technology and general management’. The respondents were asked to indicate the category that best describes the decision making authority their firms have relating to these items. The categories are: (1) By the holding company without consulting your firm; (2) By the holding company after consulting your firm; (3) Equal influence in decision making (4) By your firm after consulting with the holding company; (5) By your firm without consulting with the holding company.

**Industry:** A firm’s industry is determined by the three-digit ISIC codes based on the information on the ICI firm lists (1968, Series M, No.4, Rev.2). Then, the two-digit codes are stated in order to summarise the sectors of all participant firms in this study.

**Internationalisation:** Internationalisation is measured with the question: ‘Does your firm engage in business in other countries (e.g. foreign direct investment, export activities etc.)?’ A dummy variable is created with 1 representing ‘yes’ and 0 representing ‘no’. In case of an answer of ‘yes’ the variable is categorised as a) Export b) Foreign direct investment.

**R&D:** Firms may develop a knowledge base through R&D activities (Lane and Lubatkin 1998). For instance, investment in them can provide new knowledge, thus enabling firms to acquire and assimilate related knowledge (Tallman et al. 2004) and to enhance innovation performance (Hagedoorn and Wang 2012; Grimpe and Kaiser 2010; Leiponen 2012). R&D is measured according to the response to the question: ‘Approximately what proportion of your firm’s turnover (either direct budget or staff time) was spent on research or development activities (e.g. product, process, or design activities conducted either in-house or in collaboration) over the period 2008-2013?’ (Tomlinson 2010).

**Firm Size:** Firm size may affect the knowledge transfer, performance and innovation outcomes of an organisation, as larger firms possess greater and more

heterogeneous resources (Maurer et al. 2011). Firm size is measured as the number of employees (Wu 2008; Perez-Luno et al. 2011).

## 4.5 Empirical Study and Discussion

In this section, first, the industrial distribution and internationalisation behaviour of firms are summarised. Secondly, for only business group affiliated firms, a comparison between within group and outside group relations is given in terms of social capital and knowledge sharing. In addition, business group affiliated and independent firms are compared in terms of firm financial and innovation performance, absorptive capacity, institutional support and organisational capital. All the analyses are conducted with Stata (V14.2).

Table 4.1 shows the industries of the participant firms in this study. The largest category is the textile industry with 32 firms, whilst the machinery and equipment industry follows with 22 firms. The third equal largest sectors are shared by the food and basic metal industries, with 19 firms in each industry. In terms of internationalisation, 99 firms (80%) conduct export activities, 3 firms (2%) have foreign direct investment and 22 firms (18%) internationalise with both export and foreign direct investment activities.

**Table 4.1 Industries of Firms**

<b>Industry</b>	<b>Frequency</b>	<b>Percent (%)</b>
Coal mining	6	4.72
Food, beverages, tobacco	19	14.96
Textile, wearing, apparel, leather	32	25.20
Wood, wood products, furniture	8	6.30
Paper, paper products, printing, publishing	5	3.94
Chemicals, petroleum, coal, rubber, plastic	11	8.66
Non-metallic mineral products (except petroleum, coal)	5	3.94
Basic metal industries	19	14.96
Fabricated metal, machinery, equipment	22	17.32

### 4.5.1 Comparison between Within and Outside Group Relations

This part of the empirical analysis includes only the group affiliated firms. In order to understand further the affiliated firms' relations with other affiliates within

the group and with firms outside the group, a comparison is made between the within and outside group activities relating to social capital and knowledge sharing. In addition, the findings regarding knowledge flows between the holding companies and affiliates are presented. This subsection ends with an analysis of group firms' decision making autonomy regarding several firm functions that are related to production and marketing activities. For the group affiliated firms, the statistical significance of the difference of the within and outside group means is computed by a t test. Table 4.2 shows the means for the within group and outside group relations for the social capital, tacit and explicit knowledge sharing variables, with the differences being evaluated based on a t statistic.

**Table 4.2 Business Group Firms Within and Outside Group Relations Comparison**

<b>Variables</b>	<b>Mean</b>	<b>T value</b>
<b>Within group social interaction</b>	3.31 (0.82)	<b>0.69</b>
<b>Outside group social interaction</b>	3.24 (0.70)	
<b>Within group trust</b>	2.18 (0.97)	<b>2.65**</b>
<b>Outside group trust</b>	1.80 (0.61)	
<b>Within group tacit knowledge sharing</b>	3.64 (0.80)	<b>4.51***</b>
<b>Outside group tacit knowledge sharing</b>	3.05 (0.79)	
<b>Within group explicit knowledge sharing</b>	3.48 (0.92)	<b>2.48**</b>
<b>Outside group explicit knowledge sharing</b>	3.17 (0.87)	

Standard deviations in parentheses. Legend: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01. Two tailed tests.

On average, business group affiliates engage in social capital and knowledge sharing relations with other affiliates more than they do with firms outside the group. In terms of social capital, for only trust, is the mean of within group relations higher than for outside group. Regarding the social interaction variable, no statistical difference is found between within group and outside group relations. In terms of knowledge, for tacit and explicit knowledge sharing, the means of within group sharing are higher than those of outside group, with statistically significant differences.

These results are consistent with the previous literature, which suggests that business group affiliates refer to sister affiliates for possible relationships before engaging in business activities with other firms outside the group (Carney et al. 2011; Mahmood et al. 2011; Keister 2001). In terms of social capital, trust plays an important role in the context of affiliated firm relations. Firm ties among affiliates increase the

trust, which is difficult to establish with independent firms (Hsieh et al. 2010). Whilst group firms communicate with other members intensively within the group, the favourable result for social interaction of affiliates with other firms outside the group should not be unexpected, since group reputation and recognition allow group firms to establish strong relations with firms outside the group for their business activities (Castellacci 2015). In particular, tacit knowledge, which is associated with production tasks and more complex issues, is shared more within the group (Grant 1996b; Chang et al. 2006). Explicit knowledge sharing can be challenging even though the facilitating factors exist, such as procedures, databases and communication capacity (Fey and Furu 2008). Consequently, similar to tacit knowledge, sharing explicit knowledge may be higher and easier for the group affiliated firms because ties within the group facilitate interaction (Lamin 2013).

Regarding Turkish business groups, as aforementioned, the majority of the group affiliated firms operate under a holding company. This holding company provides them with financial and managerial resources, hence an examination of knowledge flows helps to provide understanding of the extent of benefits that affiliates obtain from knowledge of their holding companies. Table 4.3 shows knowledge flows from holding companies to affiliated firms.

**Table 4.3 Holding-Affiliate Knowledge Flows (Group Firms Only)**

<b>Items*</b>	<b>Not at all</b>	<b>Low</b>	<b>Moderate</b>	<b>Very</b>	<b>A Great Extent</b>
Knowledge about technology	6.35	9.52	26.98	42.86	14.29
Knowledge about sales and marketing	3.17	9.52	33.33	33.33	20.63
Knowledge about competitor and supplier strategies	3.23	12.90	30.65	38.71	14.52

\* Percentage

On average, affiliated firms benefit from knowledge flows on technology, sales, marketing and competitor and supplier strategies ranging between moderate and higher levels. These results are in line with other studies on business groups' knowledge sharing activities. For instance, Lee et al. (2010), examining knowledge transfers between the headquarters of Korean group affiliates and their subsidiaries,

show that the degree of knowledge transfer from headquarters to the subsidiary enhances the performance of subsidiaries.

As explained in the literature review section of this chapter, in Turkish holdings, strategic decisions are mainly exercised by families through the holding companies, who have control over the affiliates (Yiu et al. 2014). In this part, an analysis is conducted to reveal the extent of decision making of affiliates in various areas. Table 4.4 shows the decision making behaviour of affiliates based on several functions, including production, marketing, technology and management. According to the results, firms' decision making in product, R&D, marketing, production, technology and management are mainly conducted after consulting the holding company. However, in some activities, such as R&D and marketing, affiliates may also actively take part in the decision making stage. This may be related to the legal independence of firms with their own boards, although they are still dependent on family decisions about strategic areas.

**Table 4.4 The Degree of Autonomy (Group Firms Only)**

	By holding company without consulting your firm	By holding company after consulting your firm	Equal influence on decision	By your firm after consulting holding company	By your firm without consulting holding company
<b>Items*</b>					
Product range	3.17	11.11	25.40	34.92	25.40
R&D	3.17	7.94	19.05	38.10	31.75
Marketing	4.84	8.06	24.19	35.48	27.42
Production capacity	6.35	7.94	17.46	46.03	22.22
Manufacturing technology	4.76	6.35	23.81	46.03	19.05
General management	4.76	6.35	25.40	49.21	14.29

\* Percentage

#### **4.5.2 Comparison between Affiliated and Independent Firms**

In this subsection, in line with the discussion about the performance impacts of affiliation given in this chapter and the innovation benefits explained in chapter two, group affiliated and independent firms are compared in terms of performance and innovation. The statistical significance of difference of means is computed by a t test. Table 4.5 shows the means for group affiliated and independent firms for performance

and innovation variables. Differences are evaluated based on a t statistic. In addition to the main variables, the table also provides the results for all the items relating to each variable.

**Table 4.5 Performance and Innovation Comparison of Affiliated and Independent Firms**

<b>Variables and items</b>	<b>BG affiliated firms</b>	<b>Independent firms</b>	<b>T test value</b>
<b>Performance</b>	<b>3.74 (0.92)</b>	<b>3.96 (0.77)</b>	<b>1.43</b>
ROS	3.98 (0.93)	4.08 (0.91)	<b>0.58</b>
ROA	3.79 (0.98)	3.89 (0.84)	<b>0.60</b>
ROI	3.61 (1.02)	4.12 (0.81)	<b>3.10***</b>
Profit growth	3.63 (1.07)	3.85 (0.81)	<b>1.32</b>
Sales growth	3.82 (1.08)	3.95 (0.99)	<b>0.70</b>
Market share growth	3.64 (1.10)	3.82 (0.98)	<b>0.94</b>
<b>Innovation</b>	<b>3.33 (0.72)</b>	<b>3.26 (0.86)</b>	<b>-0.53</b>
<b>Product innovation</b>	<b>3.38 (0.81)</b>	<b>3.29 (0.90)</b>	<b>-0.59</b>
Introduction of new product lines	3.18 (1.04)	3.06 (1.07)	<b>-0.61</b>
Changes/ improvements to existing product lines	3.56 (0.84)	3.51 (0.95)	<b>-0.30</b>
<b>Process innovation</b>	<b>3.28 (0.79)</b>	<b>3.24 (0.94)</b>	<b>-0.29</b>
Introduction of new equipment/ technology in the production process	3.28 (0.88)	3.47 (0.99)	<b>1.12</b>
Introduction of new input materials in the production process	3.25 (1.05)	3 (1.14)	<b>-1.26</b>
Introduction of organisational changes/ improvements made in the production process	3.33 (0.83)	3.26 (1.14)	<b>-0.39</b>
<b>R&amp;D</b>	<b>1.51 (0.86)</b>	<b>1.67 (0.94)</b>	<b>1.01</b>
<b>N</b>	<b>64</b>	<b>64</b>	

Standard deviations in parentheses. Legend: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01. Two tailed tests.

According to the results, group affiliated and independent firms do not differ in terms of performance, innovation and R&D. Regarding the items of the performance variable, the means of return on investment (ROI) item differs significantly between affiliated and independent firms, with the independent firms performing better compared to affiliated ones. These results are similar to those of some studies that report no difference between affiliated and independent firms in terms of various performance measures (Gunduz and Tatoglu 2003; Khanna and Palepu 2000a). The findings, however, contradict the research where a significant difference between affiliated and independent firms in terms of several performance measures, innovation and R&D has been discovered (Chu 2004; Gonenc et al. 2007; Kim et al. 2010; Ferris et al. 2003; Hsieh et al. 2010; Wang et al. 2015; Belenzon and Berkovitz 2010). Finally, no statistical difference is found between affiliated and independent firms in

terms of R&D, whilst previous studies have provided mixed results (Kim et al. 2010; Chu 2004).

A further analysis is conducted to examine the absorptive capacity, institutional support and organisational capital differences between group and non-group firms, because these are relevant to innovation and performance (Zahra and George 2002; Subramaniam and Youndt 2005; Lane et al. 2001; Reed et al. 2003; Tomlinson and Jackson 2013). In innovation activities, absorptive capacity is related to the importance of prior knowledge in understanding and utilising the new knowledge (Lane et al. 2001). Business group affiliates' interaction among themselves may allow a setting where a certain level of knowledge is shared and created for innovation activities (Castellacci 2015). Institutional support provides firms with knowledge and enhances innovation performance, however, for group affiliates, the advantage of group reputation and recognition may allow them to establish more relations with institutions that provide these affiliates with knowledge on research, development and other activities (Hsieh et al. 2010; Lamin 2013; Tomlinson and Jackson 2013). Organisational capital is the knowledge "*created by, and stored in, a firm's information technology systems and processes that speeds the flow of knowledge through the organization*" (Reed et al. 2003, p.869). It relates to how firms accumulate and retain knowledge through manuals, databases and patents. Firms' organisational capital leads to repeated use of knowledge which may enhance innovation capabilities and performance (Subramaniam and Youndt 2005). Business group firms with their networked relations can leverage the value of organisational capital created among firms to enhance their overall innovation and performance (Yiu et al. 2014). Based on these arguments group firms are expected to have higher absorptive capacity, institutional support and organisational capital compared to independent ones.

Table 4.6 shows the means for group affiliated and independent firms for the absorptive capacity, institutional support and organisational capital variables. Differences are evaluated based on a t statistic. Similar to the performance measures, the table also shows the results for all the items relating to each variable. According to the results, group affiliated and independent firms do not differ in terms of absorptive capacity, institutional support or organisational capital. Both affiliated and independent firms have absorptive capacity to integrate existing knowledge and utilise

external firms' knowledge. Although group and non-group firms do not differ, absorptive capacity is important in relation to innovation activities as suggested in the literature (Chang et al. 2012; Escribano et al. 2009; Lane et al. 2001; Cohen and Levinthal 1990).

**Table 4.6 Comparison of Affiliated and Independent Firms in Relation to Innovation**

<b>Variables and items</b>	<b>BG affiliated firms</b>	<b>Independent firms</b>	<b>T test value</b>
<b>Absorptive capacity</b>	<b>3.76 (0.58)</b>	<b>3.78 (0.82)</b>	<b>0.15</b>
Identify and absorb external knowledge from other firms	3.51 (0.86)	3.59 (1.00)	<b>0.52</b>
Integrate existing knowledge with new knowledge acquired from other firms	3.83 (0.75)	3.86 (0.92)	<b>0.23</b>
Exploit the new integrated knowledge into concrete applications	3.95 (0.58)	3.89 (0.88)	<b>-0.47</b>
<b>Institutional support</b>	<b>3.42 (0.82)</b>	<b>3.45 (0.91)</b>	<b>0.17</b>
Firm has received support for Research and Development (R&D) activities from other firms and/ or institutions	3.27 (1.06)	3.28 (1.23)	<b>0.08</b>
You and/ or your employees have received specific business related training by other firms and/ or institutions	3.69 (0.94)	3.5 (1.17)	<b>-1.00</b>
Firm has received benefits from research activities carried out by other firms and/ or institutions	3.33 (0.96)	3.58 (0.97)	<b>1.46</b>
<b>Organisational capital</b>	<b>4.07 (0.51)</b>	<b>3.89 (0.72)</b>	<b>-1.62</b>
Knowledge is contained in manuals, databases, etc.	4.06 (0.83)	3.86 (1.18)	<b>-1.12</b>
Uses patents and licenses as a way to store knowledge	4.19 (0.77)	4.09 (0.95)	<b>-0.61</b>
Organisation embeds much of its knowledge in structures, systems and processes	4.22 (0.60)	3.97 (0.82)	<b>-1.96*</b>
Culture (stories, rituals) contains valuable ideas, ways of doing business, etc.	3.81 (0.81)	3.63 (0.97)	<b>-1.12</b>
<b>Firm size</b>	<b>6.13 (1.80)</b>	<b>5.81 (1.58)</b>	<b>-1.04</b>
<b>N</b>	<b>64</b>	<b>64</b>	

Standard deviations in parentheses. Legend: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01. Two tailed tests.

The results for institutional support are in line with the study conducted by Tomlinson and Jackson (2013) on the effect of cooperative ties and the role of institutions on innovation, according to a district affiliation. The authors find that district firms do not differ from non-district firms in terms of the institutional support that firms receive. However, these results contradict other studies that examine the institutional support in district and non-district firms (Molina-Morales and Martinez-



Fernandez 2004; 2003). Regarding which, Molina-Morales and Martinez-Fernandez (2003) show that the participation of the local institutions in the industrial district firms' activities is significantly higher than in non-district firms. Similarly, Molina-Morales and Martinez-Fernandez (2004) find that participation of local institutions is significantly related to district membership. Organisational capital is utilised by both affiliated and independent firms, although the study by Reed et al. (2003) shows a difference between the means for personal and commercial banks' organisational capital. Finally, contrary to other studies, independent firms are larger than affiliated ones (Ferris et al. 2003; Chu 2004; Kim et al. 2010).

#### **4.6 Conclusion**

This chapter has investigated various characteristics of Turkish business groups. After this review, an examination has been conducted on group affiliated firms to reveal their social capital and knowledge sharing relations within and outside the group. Knowledge flows from holding companies to affiliates and the autonomy of decision making have also been probed in order to understand the various characteristics relating to the business group concept. In addition, a comparison of affiliated and independent firms in terms of performance, innovation and several factors which may affect the performance of firms, including absorptive capacity, institutional support and organisational capital is provided. In general, while group firms' relations within and outside the group show significant differences in terms of social capital in the form of trust and tacit and explicit knowledge sharing, affiliated and independent firms do not differ in terms of innovation, performance and other characteristics, such as absorptive capacity, institutional support and organisational capital.

Affiliated firms have more trustworthy relations with other affiliates, but their social interaction with firms within and outside the group does not differ. In addition, affiliated firms share tacit and explicit knowledge with other affiliated firms more than they share with other firms outside the group. Affiliates' dense social capital and knowledge sharing relations with other affiliates are to be expected, because group firms refer to other affiliates first, before having relations with firms outside the group. Also, affiliated firms benefit from holding company knowledge flows related to

technology, marketing and strategies at moderate to high levels. The decision making relating to production, marketing, technology and management is realised after consulting the holding company. These results are in line with the evidence in the literature, where it is explained how the holding company aids affiliates through creating an internal capital market and it is dominant in group strategic decisions. The results pertaining to performance and innovation differences are in line with some studies that find no impact of group affiliation on firm performance. Moreover, as stated before, performance differences are affected by several moderating factors.

These findings provide some foundations for the propositions in chapters five and six in which social capital, knowledge sharing and innovation relations are examined in detail along with the moderating impact of group affiliation. In the present chapter, while affiliated firms' within and outside group trust, tacit and explicit knowledge sharing relations differ, no difference has been found between affiliated and independent firms in terms of innovation. In chapter five, social capital and knowledge sharing relations along with the moderation impact of affiliation are analysed after controlling for a number of firm characteristics, including firm size, firm age, industry and R&D. In order to investigate further the relationship between knowledge sharing and innovation as well as the moderating impact of affiliation, in chapter six, a more robust analysis is conducted with regression after controlling for the same variables as in chapter five. In conclusion, this chapter has provided an initial analysis of the overall research concepts that are examined in the next empirical chapters of this thesis.

## **Chapter 5 Social Capital, Knowledge Sharing and the Role of Business Group Affiliation**

### **5.1 Introduction**

This chapter explores the relations between social capital and knowledge sharing and the moderating effect of business group affiliation on these relationships. Drawing on the resource based view and social network theory, in this review, it is argued that interfirm relations in the form of knowledge transfers are facilitated by social capital (Nahapiet and Ghoshal 1998). Moreover, it is contended that these effects differ between two groups of firms, namely, group affiliated and independent ones. The focus of the study is the exchange relationships among firms, in particular, knowledge sharing relations and the facilitating role of social capital are addressed. It is asserted that the processes of interorganisational knowledge transfer are affected by the nature of the network type in which the organisations are embedded (Inkpen and Tsang 2005). As business groups are conceived as a type of network (Podolny and Page 1998; Chang 2006) the social capital that group members create may have different effects on knowledge sharing than the observed effect in independent firms. Whilst several studies have examined the knowledge transfers in business groups (Lee et al. 2010; Lee and MacMillan 2008) and the social capital effects on knowledge flows (Yli-Renko et al. 2001; Li 2005; Wu 2008), there has been relatively few studies which have investigated the social capital effects on knowledge flows in the context of business group affiliates and independent firms. Therefore, this chapter aims to examine these relationships in an emerging economy taking into account the context in which firms operate.

Considering the overall concepts of this thesis which have been explained in chapter two, in this chapter, the effect of social capital on knowledge sharing and the contingency impact of business group affiliation on this relationship is examined. Social capital is an important asset for firms in emerging economies to get access to resources in their environments. Moreover, groups as dominant forms, are characterised by their strong solidarity, resource sharing and ties among member firms. The analysis of social capital as an antecedent of knowledge sharing is important, because the former, as a facilitator, is relevant to knowledge exchanges of both

affiliated and independent firms. Uncovering these relations is achieved by examining the role of the three dimensions of social capital, namely, structural, relational and cognitive in relation to knowledge sharing along with probing the role of affiliation through an empirical analysis of the survey data.

This chapter includes a theoretical basis for the research concepts and hypotheses. The second section provides a literature review about social capital. The third section examines social capital dimensions, their relations to knowledge sharing and the moderating role of business group affiliation in the relationship between social capital dimensions and knowledge sharing. Hypotheses are developed based on the structural, relational, cognitive social capital, knowledge sharing and business group affiliation relations as appropriate. The chapter continues with section four, which explains the methodology used in this study. In the fifth section, the empirical results of the aforementioned relations are presented. Finally, in section six, a discussion of the overall results in relation to the literature is given along with the conclusion of the chapter.

## **5.2 Social Capital**

Social capital represents the “*ability of actors to secure benefits by virtue of membership in social networks or other social structures*” (Portes 1998, p.6). It facilitates the behaviour of actors (Coleman 1988), exchange of information, knowledge and other forms of capital (Koka and Prescott 2002). Baker (1990, p.619) defines social capital as “*a resource that actors derive from specific social structures and then use to pursue their interests; it is created by changes in the relations among actors*”. Nahapiet and Ghoshal (1998, p.243) define social capital as “*the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit*”. From these definitions, it can be understood that social capital acts both as a resource and a mechanism that provides access to resources (Nahapiet 2008). However, for the purposes of this study, social capital is considered as a mechanism that facilitates the actions of organisations (Carpenter et al. 2012) and the transfer of knowledge between firms (Maurer et al. 2011).

Social capital relates to the social organisation characteristics, such as networks, norms and trust, which facilitate coordination and cooperation (Putnam 1993). It allows firms access to resources through direct and indirect ties (Lin 2001). The benefits of social capital are identified as information, influence and solidarity (Adler and Kwon 2002). Moreover, it facilitates the focal actor or firm's access to broader sources of information and improves information's quality. In addition, social capital allows actors or firms achieve their goals. The solidarity benefit of social capital stems from strong social norms in a closed network of relations (Adler and Kwon 2002). Firms leverage capabilities through interfirm links embedded in social relations and networks (Uzzi and Gillespie 2002). Specifically, interfirm ties represent social capital, whereby these ties enable firms to exchange information and knowledge, with interaction between firms creating an obligation based on norms (Koka and Prescott 2002; Fonti and Maoret 2016). However, social capital has risks as well as benefits (Adler and Kwon 2002). Regarding which, establishing and maintaining relations may be costly or may provide redundant information. Moreover, strong solidarity may not always support the firms in a network. For instance, strong solidarity among group members may overembed the actor or firm in its relationships with existing actors. This embeddedness causes inertia and reduces the flow of new information (Adler and Kwon 2002; Portes 1998).

Nahapiet and Ghoshal (1998) identify three dimensions of social capital: structural, relational and cognitive. Alternatively, Adler and Kwon (2002) emphasise the external and internal dimensions of social capital. The external ties are defined as the 'bridging' forms of social capital, whereas, internal ones are referred as the 'bonding' forms. The bridging view focuses on the social capital that ties a focal actor to other actors with external direct and indirect links within a social network, whilst the bonding perspective pertains to that which is based on the internal linkages among individuals within a collectivity, such as an organisation or a community. The authors further argue that the behaviour of an actor, such as a firm, is shaped by both its internal and external linkages with other firms.

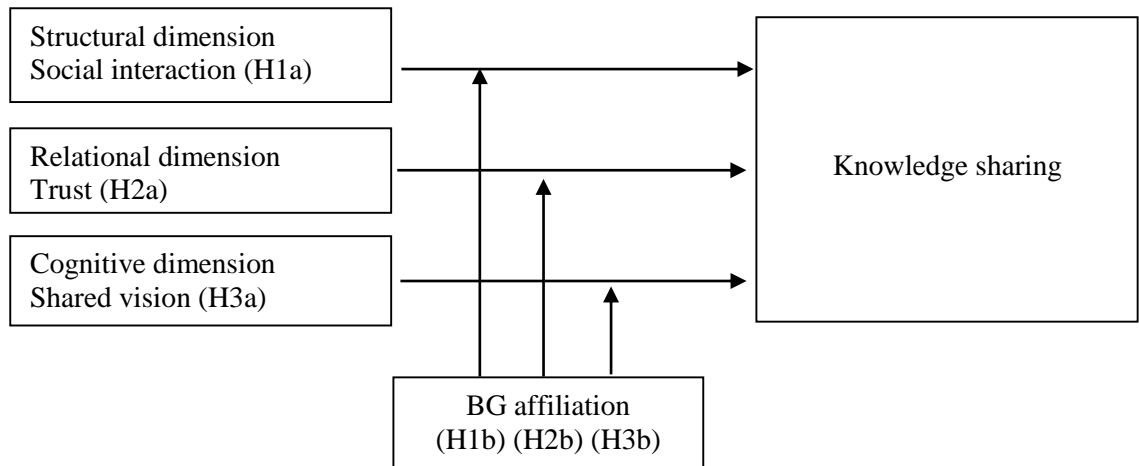
These dimension have various effects on firm performance and innovation (Batjargal 2003). Cuevas-Rodriguez et al. (2014) examine the role of internal and external relational social capital on the radical product innovation of manufacturing

and service companies. The internal social capital is defined as the linkages among individuals within an organisation, whilst the external is the links with other firms. Their results reveal that internal social capital has a positive effect on radical product innovation, which is measured through market and technological dimensions, whereas external relational capital has a positive effect only on the technological dimension of such innovation. Moreover, the effect of internal social capital is stronger than that of external social capital. From a different perspective, Koka and Prescott (2002) propose a three-dimensional model of social capital, asserting that it has three different kinds of information benefits in the form of information volume, information diversity and information richness. In their study, information volume and diversity are associated with structural social capital, whereas information richness pertains to relational capital. The authors demonstrate that the information dimensions of social capital have differential effects on firm performance of strategic alliances formed by firms in the global steel industry. The information volume and information diversity dimensions are significantly and positively related to firm performance, however, information richness has no impact. Drawing on RBV and social capital theory, Lee et al. (2001) examine the internal capabilities and external networks on performance of Korean start-up companies. The social capital of a firm is captured through the partnership-based and sponsorship-based links with external actors. The results reveal that regarding partnership-based social capital, except for ties with venture capital firms, ties with other enterprises, venture associations and universities are not significantly related to sales growth. Moreover, with respect to sponsorship-based linkages, ties with financial institutions and linkages to government agencies do not have any statistically significant effect on sales growth. These overall results do not show a strong significant impact of social capital on firm sales growth.

In this study, following Nahapiet and Ghoshal (1998), three dimensions, namely, structural, relational and cognitive social capital, are used because: first, the role of social capital and networks are relevant in emerging economies and second, these dimensions facilitate firm behaviour of knowledge exchanges (Bruton et al. 2007). Also, the social capital benefits of knowledge sharing may be different, depending on the firm's context (Koka and Prescott 2002). In the following part, first, the main effects and then, the contingency effects of affiliation are examined.

### 5.3 Social Capital Dimensions, Knowledge Sharing and Affiliation

The underlying rationale for this study's framework is that knowledge sharing relations between firms are facilitated by social capital and the impact of it on knowledge sharing differs between group affiliated and independent firms. The proposed research framework integrates the social network, knowledge and business group literatures from previous research (Yli-Renko et al. 2001; Maurer et al. 2011; Chang et al. 2006; Chang and Hong 2000; Wu 2008) by arguing that social capital dimensions, including the structural, relational and cognitive aspects, have positive impact on knowledge sharing between firms and this effect is higher for affiliates than for independent firms. The research model is summarised in Figure 5.1.



**Figure 5.1 Conceptual Model**

#### 5.3.1 Structural Social Capital

The structural dimension of social capital refers to the overall pattern and configuration of connections between actors within a social structure (Nahapiet 2008; Leana and Pil 2006; Villena et al. 2011). It is examined through two distinct perspectives in the literature: the benefits of 'closed networks' and networks characterised by 'structural holes' (Coleman 1988; Burt 1997; Moran 2005; Rowley et al. 2000). Granovetter (1973) emphasises the power of weak ties, contending that information flows among individuals are facilitated through them. Burt (1997),

drawing on insights from Granovetter (1973), defines ‘structural holes’ arguing that structural holes theory underlies the concept of social capital. Building his argument on Granovetter’s (1973) strength of weak ties, he asserts that the benefits of social capital are derived from structural holes, which provide non-redundant sources of information (Burt 1997). A structural hole is defined as “*a relationship of non-redundancy between two contacts*” (Burt 1992, p.18). These holes have information brokering opportunities, which carry unique information (Burt 2000; Moran 2005). Conversely, contacts who strongly connected to each other are likely to have similar information and therefore, they can provide redundant information benefits (Burt 2000). Dense networks are advantageous in terms of developing trust and cooperation, however, they provide redundant information from multiple sources (Rowley et al. 2000). According to this view, weak ties among actors are more valuable, because they facilitate the transmission of novel information and resources. In terms of interfirm relationships, the strength of weak ties results from their potential to increase innovation and performance by connecting a firm to knowledge sources (Capaldo 2007).

On the other hand, Coleman (1988) identifies network closure and suggests that closure of the social structure creates effective social capital in the form of trustworthiness and norms. Network closure gives increased potential for amplifying returns to the actor (Coleman 1990). The closure view focuses on the dense relations with strong ties and trust, which facilitate the exchange of information (Walter et al. 2007). Closed networks facilitate the interaction among actors, reduce exchange risk and increase the cooperation and use of resources of others (Moran 2005). In the case of interfirm relations, strong ties enhance the flows of new ideas, technological innovations and operational support (Capaldo 2007), being also associated with the exchange of high-quality information and knowledge (Rowley et al. 2000). Regarding which, in Chinese society, people rely on their close relations and strong ties rather than on weak ties in their businesses (Lin and Si 2010).

These two views are investigated in the literature with opposite findings (Capaldo 2007; Zaheer and Bell 2005; Rowley et al. 2000; Moran 2005). McEvily and Zaheer (1999), examining U.S. job shop manufacturers, find that structural holes (nonredundancy) are positively associated with firms’ abilities to acquire competitive



capabilities. Walker et al. (1997), examining the network formation and industry growth in biology start-ups, reveal that the development of network closure in the form of social capital effects the network formation and industry growth. In fact, it is found to be the better predictor of cooperation than the structural holes. Another study by Ahuja (2000) shows that in the interfirm collaboration network, increasing structural holes has a negative effect on innovation in the international chemicals industry. Rowley et al. (2000), examining structural embeddedness (density) and relational embeddedness (strong and weak ties) on firm performance, find that weak ties positively impact on firm performance, thus supporting Granovetter's (1973) weak tie argument. Moreover, density has no effect on firm performance. In sum, these opposing results show that firms benefit from both strong and weak ties in terms of performance and capability development.

Firms are embedded in a variety of interorganisational networks, such as board interlocks, trade associations, buyer-supplier relations, strategic alliances and partnerships (Gulati and Gargiulo 1999; Gulati et al. 2000; Lincoln et al. 1992). Among these ties, interlocks and cross shareholdings are considered as structural and social characteristics of business groups (Lincoln et al. 1996; Keister 2009; Maman 1999). Interlocks occur when a person affiliated with one firm sits on the board of directors of another (Zahra and Pearce 1989; Mizruchi 1996). They represent social ties and cohesion, which are used as a measure of interfirm network embeddedness (Mizruchi 1996) and are prevalent in business groups for creating horizontal interfirm relations (Yiu et al. 2007). Interlocks occur between firms but they are created by individuals. (Peng et al. 2001). That is, individual social capital created by individuals is carried to the firm level through interlocking directorates (Pennings and Lee 1998) and knowledge flows between firms are achieved through such interlocks (Haunschild and Beckman 1998; Davis 1991).

The knowledge flow benefit of interlocks may be more among affiliates than independent firms owing to the high level of trust involved (Mahmood et al. 2011). This knowledge flow can be about technology, market or innovation strategies (Keister 2009). For instance, Mahmood et al. (2011) examine the centrality of the different types of network ties in the form of buyer-supplier, equity and director interlocks on the R&D capability acquisition of Taiwanese business group affiliates. The results

show that buyer-supplier ties are more valuable to firms when the affiliate has interlocking director and equity ties. Also, the density of director interlock networks increases the value of buyer-supplier ties. In groups, social capital is created and maintained through interlocks (Heracleous and Murray 2001).

**Social interaction:** Social interaction is one of the indicators of social capital, which is densely used by all affiliated and independent firms to obtain knowledge from business partners. The extent of social interaction among individuals that share and develop knowledge, either within or between organisations, determines the knowledge created (Nonaka 1994; Nahapiet and Ghoshal 1998). Social interaction represents the structural dimension of social capital and it is one of the main drivers of knowledge flows (Tsai and Ghoshal 1998; Molina-Morales and Martinez-Fernandez 2009). Knowledge and resource exchanges are facilitated by social ties between firms (Tsai and Ghoshal 1998; Molina-Morales and Martinez-Fernandez 2003). Frequent interactions between firms in a business network enable the development of a common language which facilitates knowledge exchange (Wu and Choi 2004). Social interaction, as an important unit of structural social capital, can capture important aspects of individuals' social networks (Laursen et al. 2012). It increases knowledge sharing by intensifying the frequency, breadth and depth of exchange in the relationship (Yli-Renko et al. 2001). The literature generally shows a positive impact of social interaction on innovation (Molina-Morales and Martinez-Fernandez 2009), product innovation (Laursen et al. 2012) and knowledge acquisition (Yli-Renko et al. 2001). For instance, examining MNE subsidiaries' knowledge inflows and outflows, Noorderhaven and Harzing (2009) find a positive impact of social interaction on knowledge flows among subsidiaries. Based on these arguments it is proposed that:

**Hypothesis 1a:** Social interaction developed between firms has a positive impact on knowledge sharing.

A business group is a typical example of an organisation in which high levels of interdependence, interactions and closure exist among member firms (Yiu et al. 2003). Social relations is one of the characteristics that differentiates a business group from other organisational forms, such as a multinational corporation in that social ties are more important in the former's operations (Yiu et al. 2007). Business group

affiliates share their knowledge and coordinate their activities through social interaction ties. Specifically, sharing tacit and complex knowledge, which leads to problem solving and learning, is facilitated by social interaction among affiliates, because strong interfirm relationships are likely to be more beneficial to knowledge flows (Hansen 1999; Mahmood et al. 2011). These ties create a community-like system among individual firms (Yiu et al. 2007). Also, their scale and reputation advantages attract firms outside the group, thus being able to establish and maintain relationships with other firms outside their boundaries (Mahmood and Mitchell 2004).

Social interaction ties between affiliates make firms more comfortable in regards to sharing their knowledge. (Yli-Renko et al. 2001). Affiliates with more interaction may share and create knowledge more, because these interactions affect the willingness and motivation for exchanging knowledge (Noorderhaven and Harzing 2009). Also, repeated transactions between affiliates facilitate the exchange of tacit knowledge and resources (Wu 2008). Similar to the units in a multinational firm, social interaction ties within the group and with firms outside the group affect knowledge flows between firms (Gupta and Govindarajan 2000). In addition, social interaction within a group reduces the amount of time required for knowledge exchanges as well as enhancing the depth, breadth and efficiency of knowledge exchanges (Yli-Renko et al. 2001; Molina-Morales and Martinez-Fernandez 2009). Accordingly, it is proposed that:

**Hypothesis 1b:** The effect of social interaction on knowledge sharing is significantly higher for affiliated firms than for independent firms.

### **5.3.2 Relational Social Capital**

Relational social capital refers to the trust, norms and obligations that firms develop with each other (Nahapiet and Ghoshal 1998). It develops over time based on reciprocal relations and enhances cooperation among firms (Villena et al. 2011). Informal relationships are dominant in emerging economies and exchange activities are formalised through norms, which make engaging in business easier for actors in that relationship (Kali 1999). For instance, in Chinese business groups, firms often prefer to trade with a known partner. Moreover, relational embeddedness impels firms

to have trade relations in established business groups (Keister 2001). Specifically, in emerging economies managers engage in repeated trade with the same partners rather than search for new partners (Khanna and Rivkin 2006). Trust is one of the important aspect of social capital that affects the exchange of knowledge (Becerra et al. 2008). When firms developed trust, they become more willing to share their resources and knowledge (Tsai and Ghoshal 1998).

Tie strength is another attribute of relational social capital. Sharing knowledge between firms is not easy, but acquiring strong interpersonal relationships between them facilitates knowledge flows (Tortoriello et al. 2012). Regarding which, Reagans and McEvily (2003) examine the effect of tie strength on knowledge transfer in an R&D company and find that strong ties have a positive effect on knowledge transfer. Tortoiello et al. (2012) show that strong ties have a positive effect on knowledge acquisition during cross-unit transfers in an R&D division of a multinational company. Dyer and Nobeoka (2000) investigate the knowledge sharing routines among Toyota and its network of suppliers and find that by creating a strong ties network, the former motivates suppliers to participate in the network as well as establishing network rules and norms. These prevent suppliers from accessing Toyota's knowledge unless they share knowledge with other members in the network. These strong ties especially help firms in exploiting Toyota's production know-how as well as the existing diversity of knowledge that resides within its suppliers. Moreover, a strong ties network is effective in the diffusion of tacit knowledge, because such ties produce the trust necessary for fostering this type of knowledge transfer. Levin and Cross (2004) find a positive relationship between strong ties and receipt of useful knowledge among employees of pharmaceutical, bank and oil companies. When this notion is applied to group firms, it is asserted that strong ties that groups create for member firms support the beneficial exchanges of knowledge among business partners. Firms benefit from the group's connections and communication channels (Khanna and Rivkin 2006). Therefore, tie strength enhances the transfer of knowledge and an organisation's ability to benefit from partners (Phelps et al. 2012).

**Trust:** One of the important aspects of relational social capital is trust among firms, which is developed through repeated transactions (Villena et al. 2011). It is based on social relationships between individuals and firms (Molina-Morales and

Martinez-Fernandez 2009). The term interorganisational trust is defined as “*the extent of trust placed in the partner organization by the members of a focal organization*” (Zaheer et al. 1998, p.142). Interfirm trust is the orientation of individuals’ collectively-held trust towards partner firms (Zaheer et al. 1998). Trust-based relational capital leads to greater exchange of information and know-how between partners (Kale et al. 2000), since in such an environment, knowledge and information exchange is easier owing to low levels of opportunistic behaviour (Jarillo 1988; Leana and Pil 2006). When trust is developed in interfirm relations, firms increase their reputation, which facilitates exchange of resources (Molina-Morales and Martinez-Fernandez 2006). Uzzi (1997) emphasises the role of trust in exchange relationships and suggests that it increases firms’ opportunities and access to resources, which is difficult to accomplish with arm’s-length ties. Dyer and Nobeoka (2000) argue that some trust is necessary to share information with other firms. For instance, trust enables alliance partners to exchange information confidentially (Gulati 1998). Consequently, a firm needs to develop networks of trust, thus facilitating the knowledge sharing among business partners (Ibarra et al. 2005).

Trust facilitates the exchange of resources and external knowledge (Uzzi 1996; van Wijk et al. 2008; Inkpen and Tsang 2005). Regarding which, Dyer and Chu (2003) find a positive relationship between supplier trust and the sharing of confidential information by the supplier in Japanese and Korean automotive supplier and buyer relations. Levin and Cross (2004) show that trust mediates the link between strong ties and the receipt of useful knowledge. Szulanski et al. (2004) find a positive impact of trustworthiness on intrafirm knowledge transfers. Cheng et al. (2008), examining manufacturing supply chains in Taiwan, find a positive impact of trust on interfirm knowledge sharing. However, whilst some research shows that trust increases knowledge sharing and transfer among firms, there may be negative effects as well. For instance, Yli-Renko et al. (2001) find a negative relation between relationship quality in the form of trust and knowledge acquisition among technology based firms. Drawing on the social capital literature, Li (2005) finds no significant result regarding the general effect of trust on inward knowledge transfer to the subsidiaries from relations with headquarters and external firms. In general, trust positively affects knowledge sharing relations. Based on these general arguments it is proposed that:

**Hypothesis 2a:** Trust developed between firms has a positive impact on knowledge sharing.

Relational capital is important for the functioning and success of business groups (Hitt et al. 2002). Affiliates in a business group share norms about interfirm transactions, develop routines for contracting and enjoy the group reputation, which is the basis for interpersonal relationships among member firms (Pennings and Lee 1998). Regarding which, competitive advantage of keiretsu firms may be due to the relational capital that provides an extensive network that facilitates the flow of tacit knowledge (Hitt et al. 2002). Specifically, trust is an important aspect in groups' formation and transactions among members (Leff 1978; Granovetter 1995). This characteristic of trust distinguishes business groups from other types of organisations, where arm's-length relations prevail (Strachan 1976). Inkpen and Tsang (2005), conceptualising an intracorporate network as an interorganisational grouping, argue that some level of trust exists among members of these networks. Moreover, when two firms trust each other, they share resources with each other in a cooperative way (Molina-Morales and Martinez-Fernandez 2003). Firms are more likely to cooperate toward a common goal and trust each other, whereby knowledge transfer among these members becomes easier because of being part of the network. Networks enable access to information from reliable sources, which may be less available to outside firms (Li et al. 2008a). For instance, Chinese group firms prefer exchanges with other firms within the group where possible because of the reliability of partners (Keister 2001; Hutchings and Michailova 2004).

Interfirm relations between affiliated firms, which are characterised by mutual trust, decrease transaction costs and increase knowledge sharing (Dyer and Chu 2003). Also, with the high level of trust amongst affiliates, the need to monitor partners and the level of conflict decrease, which leads to the likelihood that knowledge will be more extensively exchanged than with independent firms (Yli-Renko et al. 2001). This trustworthy environment in a group leads to the sharing of more fine-grained information and resources, which results in a 'differentiated network' being created in which member firms share their knowledge without a fear of opportunism (Tsai 2000). Interfirm trust diminishes the information asymmetries by allowing more open and honest sharing of knowledge (Wu 2008). Based on this emphasis in the literature, it

can be expected that firms affiliated to groups develop trust among affiliates and business partners that leads to intensive knowledge sharing, which may be less available to independent firms. This raises the following hypothesis:

**Hypothesis 2b:** The effect of trust developed between firms on knowledge sharing is significantly higher for affiliated firms than for independent firms.

### 5.3.3 Cognitive Social Capital

The cognitive dimension of social capital refers to the “*resources providing shared representations, interpretations, and systems of meaning among parties*” (Nahapiet and Ghoshal 1998, p.244). Common values and a shared vision are deemed the major indicators of the cognitive dimension of social capital (Tsai and Ghoshal 1998). Also, Inkpen and Tsang (2005) emphasise the shared goals and shared culture as two aspects of cognitive social capital. Shared goals are defined as “*the degree to which network members share a common understanding and approach to the achievement of network tasks and outcomes*”. Shared culture is the “*degree to which norms of behaviour govern relationships*” (Inkpen and Tsang 2005, p.153). Cognitive capital in the form of shared culture and goals provides a shared vision to actors, which results in them gaining an understanding of the norms and common goals (Villena et al. 2011). Shared language and meanings enable actors to gain access to the information and resources of their social relations (Maurer and Ebers 2006). High levels of mutual expectations enhance knowledge acquisition since shared expectations and goals reduce the need for formal monitoring and hence, firms tend to exchange knowledge and exploit other firms’ knowledge (Yli-Renko et al. 2001).

**Shared Vision:** A shared vision facilitates individual and group actions that can benefit the whole organisation (Tsai and Ghoshal 1998). Common goals diminish the likelihood of free-rider problems (Leana and Pil 2006). In networked relations with shared vision, members have similar perception about their interactions, which supports the exchange of ideas and resources. Moreover, a shared vision helps firms to integrate knowledge (Inkpen and Tsang 2005), because when parties understand each other knowledge flows are less difficult (Hansen 1999). Regarding which, Edelman et al. (2004), based on a case study in two U.K. firms, propose that cognitive

social capital in the form of shared language and experience facilitates knowledge sharing. Newell et al. (2004), based on a case study in the U.K., argue that common understanding is essential for the integration and acquisition of knowledge in project teams. Drawing on the social capital literature, Li (2005) finds that shared vision has a strong effect on inward knowledge transfer to subsidiaries from headquarters and external interfirm relations in Chinese multinationals. Accordingly, a shared vision contributes knowledge flows since it provides mutual understanding and helps firms to integrate other firms' knowledge (van Wijk et al. 2008). Hence, it is proposed that:

**Hypothesis 3a:** Shared vision developed between firms has a positive impact upon knowledge sharing.

A shared vision represents the collective goals of the members of an organisation. In business groups, shared vision and culture are binding mechanisms that provide members with a common language that facilitates communication. Moreover, a shared vision and culture help firms in a group to develop collective goals among themselves (Yiu et al. 2003). Common perceptions, goals and interests about firm activities diminish misunderstandings and help firms to share their resources freely (Tsai and Ghoshal 1998). In an intracorporate network, members have a common goal generally set by headquarters and they operate under a common corporate culture (Inkpen and Tsang 2005).

Similar organisational culture that affiliated firms enjoy fosters shared vision, which in turn, enhances the exchange of knowledge and collaboration (Li 2005). Moreover, member firms are likely to pursue this mutual understanding with the firms outside their groups, as they also wish to cooperate with firms outside their boundaries for smooth knowledge flows. Interfirm knowledge exchange may be easier in these networks, because different firms usually share similar values and common corporate languages that can facilitate communication in the exchange process (Tsai 2000). Business groups may represent such a network in which member firms work for common goals, share knowledge for group activities and benefit from a group vision (Yiu et al. 2003). Consequently, it is proposed that:



**Hypothesis 3b:** The impact of shared vision between firms on knowledge sharing is significantly higher for affiliated firms than for independent firms.

The next sections provide the methodological approach used in this study and the results related to proposed hypotheses, which explore the relationships between social capital, knowledge sharing and affiliation.

## 5.4 Methodology

The data for this chapter comes from the administered survey, full details of which are provided in chapter three. First, the model is specified before outlining the measurement of the variables, measurement model assessment (using exploratory and confirmatory factor analyses), examination of common method variance and testing the nonresponse bias related to this study.

### Model Specification

$$\text{Knowledge sharing} = \beta_0 + \beta_1 \text{Firm size} + \beta_2 \text{Firm age} + \beta_3 \text{Industry} + \beta_4 \text{R\&D} + \beta_5 \text{Affiliation} + \beta_6 \text{Social interaction} + \beta_7 \text{Trust} + \beta_8 \text{Shared vision} + \beta_9 \text{Social interaction X Affiliation} + \beta_{10} \text{Trust X Affiliation} + \beta_{11} \text{Shared vision X Affiliation} + \epsilon_i \quad (1)$$

In this model, first, the dependent variable, knowledge sharing, is regressed on the control variables firm size, firm age, industry and R&D. Next, the independent variables affiliation, social interaction, trust, shared vision and the moderation effect of affiliation are added. The possible endogeneity of the social capital variables is examined with the Durbin and Wu-Hausman tests, the details and results of which are presented in Appendix 5.5. According to the results, social interaction, trust and shared vision variables are exogenous and thus, the main and the moderation effects are analysed using the ordinary least squares (OLS) estimator. The next subsection discusses the construction of the variables.

### 5.4.1 Variables

#### Dependent Variable

**Knowledge Sharing:** Knowledge sharing is examined according to the knowledge characteristics, tacit and explicit (Hansen 1999; 2002; Im and Rai 2008; Lee et al. 2010). Regarding which, in the previous literature, tacitness of knowledge is measured according to whether the knowledge transferred is written and well documented, whereby if this is the case, then it is not tacit (Hansen 1999; Hansen et al. 2005; Levin and Cross 2004). Another measurement is based on the complexity, codifiability and observability (Cavusgil et al. 2003). Some of the studies emphasise the content of the knowledge that is being shared, which includes items, such as marketing expertise, managerial techniques, know-how and work expertise etc. (Becerra et al. 2008; Dhanaraj et al. 2004; Lane et al. 2001; Shenkar and Li 1999). On the other hand, explicit knowledge is measured through sharing of manufacturing and production processes, knowledge about products, industry trends, procedural manuals etc. (Becerra et al. 2008; Dhanaraj et al. 2004; Lane et al. 2001).

In this study the dependent variable, knowledge sharing, is more related to procedural types, including managerial and marketing know-how (Gupta and Govindarajan 2000; Schulz 2001). Here, the focus is more on the social capital effect on sharing rather than the knowledge itself which has an impact on firm performance or innovation (Maurer et al. 2011). That is, knowledge sharing is measured through the items ‘market trends and opportunities’, ‘managerial techniques’ and ‘management systems and practices’, following Gupta and Govindarajan (2000) and Dhanaraj et al. (2004). The measurement items relating to knowledge sharing variable have been presented in Table 3.1 in chapter three. Knowledge sharing in this chapter is considered as reciprocal flows between firms and their suppliers and buyers (Sammarrà and Biggiero 2008). The respondents were asked to assess their firms’ knowledge sharing activities during the past five years on a Likert scale ranging from 1= Strongly disagree to 5= Strongly agree. A composite measure is calculated based on the average of all the items for suppliers and buyers. Also, for group affiliated firms, an average of all the items related to within group knowledge sharing and outside

group knowledge sharing is obtained. The Cronbach's alpha value for the knowledge sharing variable is 0.91.

### **Independent Variables**

The independent variables used in this study relate to social capital, including social interaction, trust and shared vision along with business group affiliation. The measurement of these variables is explained below.

**Social Interaction:** Social interaction is one of the aspects of structural social capital, which refers to informal social relations among individuals (Laursen et al. 2012; Molina-Morales and Martinez-Fernandez 2009). High levels of social interaction provide firms with information benefits in terms of access and timing (Laursen et al. 2012). Specifically, social interaction increases knowledge flows between the parties in an exchange relationship (Yli-Renko et al. 2001). In this study, social interaction is measured with the items 'spending a considerable amount of time on social events with suppliers/ buyers', 'not having intensive network between our firm and suppliers/ buyers' and 'spending a considerable amount of time on business related events (training, seminars etc.) with suppliers/ buyers', following Molina-Morales and Martinez-Fernandez (2009) and Laursen et al. (2012). The measurement items relating to the social interaction variable have been presented in Table 3.1 in chapter three. The respondents were asked to assess their firms' social interaction activities during the past five years on a Likert scale ranging from 1= Strongly disagree to 5= Strongly agree. A composite measure is calculated based on the average of all the items for suppliers and buyers. For group affiliated firms, an average of all the items related to within group and outside group social interaction is obtained. The Cronbach's alpha value for the social interaction variable is 0.88.

**Trust:** Trust has been used extensively in the literature as an indicator of relational social capital (Tsai and Ghoshal 1998; Zaheer et al. 1998; Leana and van Buren 1999; Dyer and Chu 2003; Szulanski et al. 2004; McEvily and Marcus 2005). Trust in exchange relations facilitates knowledge sharing, since the opportunistic behaviour diminishes in a trustworthy environment (Leana and Pil 2006). The extent of trust in knowledge sharing relations with business partners, such as suppliers and

buyers, is measured with the items ‘never have the feeling of being misled in business relationships’, ‘until they prove that they are trustworthy in business relationships you remain cautious’, ‘cover everything with detailed contracts’, ‘get a better impression the longer the relationships you have’, following Gaur et al. (2011). The measurement items related to trust variable have been presented in Table 3.1 in chapter three. The respondents were asked to assess their firms’ level of trust during the past five years on a Likert scale ranging from 1= Strongly disagree to 5= Strongly agree. A composite measure is calculated based on the average of all the items for suppliers and buyers. Similar to the social interaction measure, an average of all the items related to within group and outside group trust is calculated. The Cronbach’s alpha value for the trust variable is 0.86.

**Shared Vision:** Shared vision refers to a shared code that facilitates the way of acting in a system of relations (Molina-Morales and Martinez-Fernandez 2006). Firms that commit to developing a shared vision and culture are more willing to exchange knowledge and resources with their partners (Villena et al. 2011; Yli-Renko et al. 2001). It is operationalised with the items ‘sharing the same vision as your suppliers/ buyers’, ‘not sharing similar approaches to business dealings as your suppliers/ buyers’, ‘sharing compatible goals and objectives with suppliers/ buyers’, ‘not sharing similar corporate culture/values and management style as your suppliers/ buyers’, following Villena et al. (2011). The measurement items related to shared vision variable have been presented in Table 3.1 in chapter three. The respondents were asked to assess their firms’ extent of shared vision during the past five years on a Likert scale ranging from 1= Strongly disagree to 5= Strongly agree. A composite measure is calculated based on the average of all the items for suppliers and buyers. The items are not repeated for group firms’ outside relations and the reversed items relating to three social capital variables are stated in the questionnaire. The Cronbach’s alpha value for the shared vision variable is 0.90.

**Business Group Affiliation:** To make a distinction between business group affiliated and independent firms a dummy variable is used, which has been utilised in similar studies to indicate business group affiliation (Belenzon and Berkovitz 2010; Chang et al. 2006; Chittoor et al. 2015) and industrial district affiliation (Molina-Morales and Martinez-Fernandez 2003; 2004; 2010). The initial questionnaire before

the pilot study included all the sections relevant to affiliated and independent firms, however, since this was not clear for the respondents, two questionnaires were prepared, one for each type. The affiliation information was confirmed with respondents and then the relevant questionnaire was sent. The question, 'Is your firm a part of business group (holding)' was retained in both questionnaires for making a comparison between the initial confirmation and the respondents' answers. Two questionnaires were dropped from the analysis since the affiliation information was not clear. Firms that belong to a group are coded as 1, whereas those that do not take a value of 0.

### **Control Variables**

In order to ensure the robustness of the study, several control variables, including firm size, firm age, industry and R&D, are used in this study.

**Firm Size:** Firm size may affect the knowledge transfer of an organisation, as larger firms possess greater and more heterogeneous resources (Maurer et al. 2011). Firm size is measured as the number of employees (Wu 2008; Perez-Luno et al. 2011).

**Firm Age:** Firm age may influence the ability of knowledge sharing relations; older firms may have an experience advantage through having established relationships with buyers, suppliers or competitors (Yli-Renko et al. 2001). Firm age is measured by the number of years since the founding date of the firm (Villena et al. 2011; Maurer et al. 2011).

**Industry:** Different industries may exhibit varying knowledge sharing patterns and accordingly, performance outcomes (Yli-Renko et al. 2001). A firm's industry is determined by the three-digit ISIC codes based on the information on the ICI firm lists (1968, Series M, No.4, Rev.2). Then, a dummy variable is created with 1, representing medium technology industries (chemical & petroleum, basic metal, machinery & equipment) and 0 representing low technology industries (coal mining, food & beverages, textile, wood & furniture, paper).

**R&D:** Firms may develop a knowledge base through R&D activities (Lane and Lubatkin 1998). For instance, investment in them can provide new knowledge, thus enabling firms to acquire and assimilate related knowledge (Tallman et al. 2004) and to enhance innovation performance (Hagedoorn and Wang 2012; Grimpe and Kaiser 2010; Leiponen 2012). R&D is measured according to the response to the question: ‘Approximately what proportion of your firm’s turnover (either direct budget or staff time) was spent on research or development activities (e.g. product, process, or design activities conducted either in-house or in collaboration) over the period 2008-2013?’ (Tomlinson 2010).

#### **5.4.2 Measurement Model Assessment, Common Method Variance and Nonresponse Bias**

The validity of the measurement model was assessed through exploratory and confirmatory factor analyses. A principal component factor analysis (PCF) was conducted with orthogonal (varimax) rotation, utilising the social capital (social interaction, trust, shared vision) variables (for full details see Appendix 5.1). The Cronbach’s alpha values for the social interaction, trust, shared vision (after item deletion) are 0.88, 0.86 and 0.90 respectively, which all exceed the minimum (0.7) acceptable threshold (Hair et al. 2010). Both convergent and discriminant validity were satisfied through confirmatory factor analysis (CFA), with the full details being presented in Appendix 5.2.

In order to assess the common method variance (CMV), Harman’s one factor test was conducted with principal component factor and confirmatory factor analyses (Podsakoff et al. 2003). First, the test was conducted with two models in which all measures were loaded into a principal component factor analysis, where five and four factors emerged, with the largest factors accounting for 31.01% and 34.66% of the total variance in each model, respectively. One general factor did not emerge from any of the models and therefore, common method bias is unlikely to be a problem in the dataset. Also, Harman’s one factor test was repeated with confirmatory factor analysis (see Appendix 5.3 for full details).

Finally, for nonresponse bias, a t-test was conducted on the mean differences between the early and late respondents with regard to knowledge sharing and social capital variables (Armstrong and Overton 1977). The results do not show any significant differences between early and late respondents, thus suggesting that nonresponse is not a concern in this study (see Appendix 5.4).

## 5.5 Results

In this section, the hypotheses proposed in this chapter, are tested through hierarchical moderated regression analysis with Stata (V14.2). First, the descriptive statistics and the relations between the variables with a correlation matrix are provided. Second, the results are presented along with a discussion of the relevant assumptions. Finally, the overall results of this chapter are discussed in relation to literature in the discussion and conclusion section.

### 5.5.1 Descriptive Statistics and Correlations

An overview of the relations between knowledge sharing, social capital and the affiliation variables are provided with correlation analysis. Table 5.8 provides the descriptive statistics, including the means, standard deviations and correlations of the variables used in the study. Also, the variance inflation factors (VIF) and Cronbach's alpha ( $\alpha$ ) values are reported.

**Table 5.8 Descriptive Statistics and Correlations**

Variables	Mean	SD	1	2	3	4	5	6	7	8	9
1.Know shr.	3.38	0.74	1								
2.Social int.	3.41	0.79	0.38*	1							
3.Trust	1.94	0.68	-0.16*	-0.05	1						
4.Shared vis.	3.53	0.90	0.21*	0.17*	-0.07	1					
5.Affiliation	0.5	0.50	-0.02	-0.12	0.05	0.00	1				
6.Firm size	5.97	1.70	0.19*	0.06	-0.05	0.03	0.13	1			
7.Firm age	33.44	16.52	0.06	0.03	-0.01	-0.00	0.03	0.25*	1		
8.Industry	0.44	0.50	-0.09	-0.09	0.12	0.04	0.01	-0.17*	0.06	1	
9.R&D	1.59	0.90	0.03	0.13	-0.01	-0.07	-0.10	0.02	-0.06	-0.08	1
<b>VIF</b>			n.a.	1.58	1.69	2.66	1.06	1.23	1.14	1.08	1.16
<b>Cronbach's <math>\alpha</math></b>			0.91	0.88	0.86	0.90	n.a.	n.a.	n.a.	n.a.	n.a.

\*p<0.1 (2-tailed) n.a.: Not available SD: Standard deviation VIF: Variance inflation factor

According to the correlation matrix, whilst weak, social interaction and shared vision are positively correlated with knowledge sharing, whereas trust has a negative correlation. The positive correlation between two social capital variables and knowledge sharing provides a first indication that social interaction and shared vision may affect knowledge sharing positively. Also, firm size is positively related to knowledge sharing. The next part presents the results.

### **5.5.2 Econometric Results**

Equation (1) was estimated using an OLS estimator and for omitted variable bias, the model was assessed through Ramsey's regression specification error test (RESET) (Cameron and Trivedi 2010). The estimated p value is 0.23 ( $p > 0.05$ ), thus suggesting the model does not have omitted variable bias (95% significance).

Prior to the creation of interaction terms, independent variables (except BG affiliation dummy) were mean-centred to reduce the potential problem of multicollinearity (Aiken and West 1991; Cohen et al. 2003). The individual variable VIF values are smaller than the recommended maximum value of 10 (Hair et al. 2010) and range from 1.06 to 2.66, therefore, multicollinearity is unlikely to be a problem in this study. Heteroscedasticity was examined with a Breusch-Pagan test and a White's test (Cameron and Trivedi 2010), the details of these with the results are given in Appendix 5.6 along with a comparison of the homoscedasticity-only-standard and heteroscedasticity-robust standard errors (Stock and Watson 2015).

Table 5.9 presents the analysis results for the effect of social interaction, trust and shared vision on knowledge sharing. It also shows the moderating role of affiliation on the impact of three social capital variables on knowledge sharing. Unstandardised coefficients and standard errors are reported. Model 1 contains all the control variables, namely, firm size, firm age, industry and R&D. In model 2, the affiliation and social interaction variables are added. Model 3 and model 4 include the trust and shared vision variables, respectively. In model 5, the interaction term between social interaction and affiliation is included, whilst in model 6, the interaction term between trust and affiliation is added. In model 7 the interaction term between shared



vision and affiliation is entered and model 8 includes all the variables along with the interactions used in the study.

**Table 5.9 Results of the Regression Analysis**

<b>Dependent variable: Knowledge sharing</b>								
	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>	<b>Model 6</b>	<b>Model 7</b>	<b>Model 8</b>
<b>Control variables</b>								
Firm size	0.062 (0.041)	0.060 (0.039)	0.062 (0.041)	0.072* (0.041)	0.056 (0.039)	0.069* (0.041)	0.086** (0.041)	0.078** (0.039)
Firm age	0.002 (0.004)	0.001 (0.004)	0.002 (0.004)	0.001 (0.004)	0.001 (0.004)	0.001 (0.004)	0.000 (0.004)	-0.002 (0.004)
Industry	0.138 (0.135)	-0.084 (0.129)	-0.107 (0.136)	-0.097 (0.135)	-0.088 (0.129)	-0.093 (0.135)	-0.093 (0.134)	-0.023 (0.125)
R&D	0.022 (0.074)	-0.013 (0.071)	0.021 (0.074)	0.027 (0.074)	-0.007 (0.072)	0.055 (0.076)	0.018 (0.073)	0.041 (0.071)
<b>Independent variables</b>								
Affiliation		0.041 (0.127)	-0.015 (0.133)	-0.057 (0.133)	0.035 (0.128)	-0.020 (0.132)	-0.058 (0.132)	-0.024 (0.123)
Social interaction <b>H1a</b>		<b>0.348***</b> <b>(0.085)</b>			<b>0.385***</b> <b>(0.105)</b>			<b>0.389***</b> <b>(0.099)</b>
Trust <b>H2a</b>			<b>-0.170*</b> <b>(0.098)</b>			-0.304** (0.124)		<b>-0.275**</b> <b>(0.114)</b>
Shared vision <b>H3a</b>				<b>0.171**</b> <b>(0.073)</b>			0.005 (0.116)	-0.037 (0.108)
<b>Interactions</b>								
Social int. X Affiliation <b>H1b</b>					-0.110 (0.182)			-0.297 (0.181)
Trust X Affiliation <b>H2b</b>						<b>0.367*</b> <b>(0.210)</b>		<b>0.382*</b> <b>(0.194)</b>
Shared vis. X Affiliation <b>H3b</b>							<b>0.274*</b> <b>(0.151)</b>	<b>0.299**</b> <b>(0.143)</b>
_cons	2.956*** (0.296)	1.842*** (0.391)	3.293*** (0.392)	2.322*** (0.493)	1.733*** (0.432)	3.469*** (0.365)	2.879*** (0.494)	2.251*** (0.600)
<b>R<sup>2</sup></b>	0.038	0.162	0.063	0.086	0.165	0.087	0.112	0.271
<b>Adj R<sup>2</sup></b>	0.006	0.118	0.014	0.037	0.114	0.031	0.056	0.196
<b>F</b>	1.176	3.710***	1.295	1.756	3.215***	1.566	2.008*	3.618***
<b>N</b>	123	122	123	119	122	123	119	119
<b>VIF (mean)</b>	1.05	1.05	1.05	1.05	1.23	1.25	1.52	1.63

Unstandardised regression coefficients. Standard errors in parentheses. Legend: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01. Two tailed tests.

Of the control variables, only firm size ( $b = 0.078$ ,  $p < 0.05$ ) has a positive and significant impact on knowledge sharing, indicating that larger firms are more likely to share knowledge. On the other hand, firm age, industry and R&D have no impact on knowledge sharing. Hypothesis 1a predicts a positive impact of social interaction on knowledge sharing. Social interaction has a positive and significant impact on knowledge sharing in model 2 ( $b = 0.348$ ,  $p < 0.01$ ) and the effect remains positive in the full model ( $b = 0.389$ ,  $p < 0.01$ ), thus hypothesis 1a is supported. Hypothesis 2a proposes a positive relationship between trust and knowledge sharing. Contrary to the expectations, in model 3, trust has a negative and significant impact on knowledge sharing ( $b = -0.170$ ,  $p < 0.1$ ) and the effect remains negative in the full model ( $b = -0.275$ ,  $p < 0.1$ ), hence hypothesis 2a is not supported. Hypothesis 3a predicts a positive impact of shared vision on knowledge sharing. Shared vision has a positive and significant impact on knowledge sharing in model 4 ( $b = 0.171$ ,  $p < 0.05$ ) and therefore, hypothesis 3a is supported.

In this study, the moderator variable affiliation is considered to form the relationship between social capital variables and knowledge sharing. Following Prescott (1986), the type of the moderator variable (affiliation) was determined using a moderated regression analysis. First, there is a significant interaction between affiliation and trust and between affiliation and shared vision (with the exception of the interaction term between social interaction and affiliation). Second, the effect of affiliation on knowledge sharing is insignificant and thus the variable affiliation is a pure moderator and it effects the form of the relationship between trust, shared vision and knowledge sharing. A moderated regression analysis is appropriate for the purpose of testing the mentioned effects.

Testing hypotheses 1b, 2b and 3b involves examining the moderating effect of group affiliation on the relationship between the social capital variables and knowledge sharing. Hypothesis 1b proposes that the effect of social interaction on knowledge sharing is significantly higher for affiliated firms than for independent firms. To test this hypothesis, the interaction term between social interaction and affiliation is added in model 5. The coefficient for the interaction term is insignificant ( $b = -0.110$ ,  $p > 0.1$ ) and therefore, hypothesis 1b is not supported. Hypothesis 2b proposes that the effect of trust on knowledge sharing is significantly higher for

affiliated firms than for independents. In model 6, the interaction term between trust and affiliation is added. The coefficient for the interaction term is positive and significant ( $b = 0.367$ ,  $p < 0.1$ ) and remains significant in the full model ( $b = 0.382$ ,  $p < 0.1$ ) and hence, hypothesis 2b is supported. Hypothesis 3b proposes that the effect of shared vision on knowledge sharing is significantly higher for the affiliated firms than for independent firms. In model 7, the interaction term between shared vision and affiliation is added. The coefficient for the interaction term is positive and significant ( $b = 0.274$ ,  $p < 0.1$ ) and remains so in the full model ( $b = 0.299$ ,  $p < 0.05$ ) and consequently, hypothesis 3b is supported.

## **5.6 Discussion and Conclusion**

### **5.6.1 Discussion**

The aim of this chapter has been to investigate the facilitating role of social capital in knowledge sharing and the moderation impact of business group affiliation on these relationships. First, a positive impact of social capital on knowledge sharing was proposed and then it was argued that the impact of social capital on knowledge sharing is stronger for affiliated firms than for independent ones. Table 5.11 presents the overall results relating to hypotheses posited in this chapter. In general, the results suggest that while social interaction and shared vision have a positive impact on knowledge sharing, trust has a negative effect. In addition, business group affiliation enhances the impact of trust and shared vision on knowledge sharing, however, affiliation does not affect the social interaction and knowledge sharing relationship. The results are generally consistent with research that examines the impact of social capital on innovation (Molina-Morales and Martinez-Fernandez 2010; Perez-Luno et al. 2011; Laursen et al. 2012; Carmona-Lavado et al. 2010; Luk et al. 2008), firm performance (Acquaah, 2007; Lawson et al. 2008; Carey et al. 2011; Gaur et al. 2011) and knowledge flows (Wu 2008; Dyer and Chu 2003; Noorderhaven and Harzing 2009; Reagans and McEvily 2003; Tortorello et al. 2012).

**Table 5.11 Overview of the Hypotheses and Findings**

		<b>Hypotheses</b>	<b>Findings</b>
<b>Main effects</b>		<b>Main effects of Social capital</b>	
Social interaction	<b>H1a</b> (+)	Social interaction developed between has a positive impact on knowledge sharing.	<b>Supported</b>
Trust	<b>H2a</b> (-)	Trust developed between firms has a positive impact on knowledge sharing.	<b>Not supported</b>
Shared vision	<b>H3a</b> (+)	Shared vision developed between firms has a positive impact on knowledge sharing.	<b>Supported</b>
<b>Interaction</b>		<b>Moderation effect of Business group affiliation</b>	
Social int. X Affiliation	<b>H1b</b> (n.s.)	The effect of social interaction on knowledge sharing is significantly higher for affiliated firms than for independent firms.	<b>Not supported</b>
Trust X Affiliation	<b>H2b</b> (+)	The effect of trust developed between firms on knowledge sharing is significantly higher for affiliated firms than for independent firms.	<b>Supported</b>
Shared vis. X Affiliation	<b>H3b</b> (+)	The effect of shared vision between firms on knowledge sharing is significantly higher for affiliated firms than for independent firms.	<b>Supported</b>

n.s.: Not significant

As expected, regarding hypothesis 1a, a positive impact of social interaction on knowledge sharing is found. These the results are consistent with prior studies, in which it argued that communication, repeated interactions and ties between firms lead to increased knowledge sharing (Wu 2008; Noorderhaven and Harzing 2009). Since knowledge flows are difficult owing to sticky nature of knowledge (Szulanski 1996), the process is facilitated by social interaction (Yli-Renko et al. 2001). Strong ties and the frequency of interactions between firms contribute to the knowledge flows (Reagans and McEvily 2003; Tortorello et al. 2012).

Contrary to the expectations, for hypothesis 2a, a negative impact of trust on knowledge sharing is observed. This result contradicts some other studies, which have examined the role of trust in networked firms (Dyer and Chu 2003; Becerra et al. 2008). However, this negative impact of trust on knowledge sharing is in line with other studies that have found a curvilinear relationship of trust with innovation and performance, where the impact of trust becomes negative (Molina-Morales and Martinez-Fernandez 2009; Villena et al. 2011). Also, in another study by Wu and Choi (2004), trust shows no impact on synergy creation with partners. These negative and insignificant impacts may be observed because extensive trust between firms may lead to an understanding that knowledge exchange occurs when needed and consequently, the incentive to do so is reduced (Yli-Renko et al. 2001). Also, a high level of trust

between firms may cause the risk of opportunism or ineffective decision making, which does not result in effective knowledge exchanges (Villena et al. 2011).

Regarding hypothesis 3a, it emerges that shared vision affects knowledge sharing positively. The outcome regarding the impact of cognitive social capital in the form of shared vision on knowledge sharing is similar to other studies, whereby firms' shared vision among themselves enhances mutual interests and facilitates common actions (Villena et al. 2011). Moreover, coordination to exchange knowledge between firms is facilitated by shared understanding. However, firms may be unwilling to share their knowledge in a cooperative way in case of a lack of vision among themselves (Li 2005).

Whilst the outcome regarding hypothesis 1b shows an insignificant moderation impact of affiliation on the relationship between social interaction and knowledge sharing, for hypotheses 2b and 3b, a positive moderation impact of affiliation is found between trust, shared vision and knowledge sharing. Despite the main impact of social interaction is significant, the interaction effect of affiliation with social interaction on knowledge sharing is insignificant. Contrary to a similar study, which shows a positive impact of social interaction on knowledge sharing among MNC subsidiaries (Noorderhaven and Harzing 2009), affiliates do not benefit from social interaction in terms of knowledge sharing, according to the outcomes of this study.

This result is in line with some other research (Villena et al. 2011; Maurer et al. 2011), which elicits that too much social interaction, greater number of ties or structural embeddedness may not be beneficial in terms of knowledge sharing and hence, other factors, such as tie strength or trust, may be the main drivers. Similarly, Wu and Leung (2005) find no impact of network ties on firm performance. Rowley et al. (2000), also, report no support for firms' structural embeddedness, in the form of density, having an impact on performance in alliance networks. This result may be observed owing to affiliates' overembedded social relations in their networks (Uzzi 1997). Frequent interactions, especially with other affiliates, may embed firms in a network where interaction does not lead to more knowledge flows (Perez-Luno et al. 2011). Also, this might have happened because of the emerging economy context, that is, in emerging economies social interaction ties are important to all firms regardless

of being a member of a business group in order to operate and maintain knowledge exchanges (Peng and Luo 2000; Park and Luo 2001).

Despite the negative impact of trust on firms' knowledge sharing, mutual trust between affiliates and with firms outside the group leads to increased knowledge sharing. The positive moderation impact of affiliation on the relationship between trust and knowledge sharing is in line with the existing studies which examine the impact of trust on firm performance (Zaheer et al. 1998; Gaur et al. 2011; Lawson et al. 2008; Wu and Leung 2005). Interfirm relations between affiliated firms, which are characterised by mutual trust, may lower transaction costs and increase knowledge sharing (Dyer and Chu 2003). Specifically, tacit knowledge flows may be highly related to partner firms' trustworthiness and consequently, affiliated firms share such knowledge by creating trustworthy relationships with other affiliates (Becerra et al. 2008; Levin and Cross 2004). In a study, which examines the impact of trust on inward knowledge transfers, Li (2005) emphasises the role of trust in knowledge sharing between subsidiaries of an MNC and local firms as well as the relations within the MNC. Similarly, in this study, trust is more effective in relation to sharing knowledge when firms are affiliated with a group. That is, whilst trust has a negative impact on knowledge sharing in overall the sample, in the context of business groups, affiliation positively moderates the relationship. This result suggests that affiliates' existing level of trust and established relations with other firms outside their boundaries have an impact on knowledge sharing. Also, affiliation with a group promotes the impact of a shared vision on knowledge sharing, whereby affiliates' long term shared understanding and goals facilitate knowledge sharing (Li 2005).

### **5.6.2 Conclusion**

In this chapter, the relationships between social capital, knowledge sharing and business group affiliation have been examined. In general, structural and cognitive dimensions of social capital, which are characterised by social interaction and shared vision, respectively, have a positive effect on knowledge sharing. Conversely, the relational dimension, in the form of trust, has a negative impact. Affiliation with a group has no moderation impact on the relationship between social interaction and knowledge sharing, however, it positively moderates the relationship between trust

and knowledge sharing. Also, affiliation with a group positively interacts with shared vision in its effect on knowledge sharing.

These results have some implications for the management of social capital and knowledge exchange relations in emerging economies, particularly in the context of business groups. Firstly, firms in emerging economies should engage in social interaction and develop shared vision among themselves in order to achieve effective knowledge sharing. However, whilst some level of trust constitutes the base of the exchange relationships, firms should be cautious when developing trust among themselves, since trustworthy settings may not always lead to more knowledge flows. This could be because of an understanding that existing levels of trust may result in sharing more knowledge, which indeed, has turned out not to be the case, according to the results of this study. Moreover, extensive trust will not lead to more knowledge flows, if decision makers are not willing to exchange what they know. Secondly, firms affiliated with a group enjoy the benefits of trustworthy relations and shared vision in terms of knowledge sharing. Nevertheless, they should be aware that the embedded social interaction ties that they have with their affiliates or the ties that they establish with firms outside their boundaries do not have impact on knowledge sharing. The social relations that they establish over time may trap affiliates in their own network and therefore, in order to achieve effective knowledge sharing, affiliates should try to form more effective relations or consider strengthening their relations with firms outside the group.

This chapter has shown that whilst social interaction and shared vision have a positive impact on knowledge sharing, trust has a negative impact. However, business group affiliation positively moderates the relationship between trust and knowledge sharing. Also, whilst affiliation has no moderation impact between social interaction and knowledge sharing, it positively moderates the relationship between shared vision and knowledge sharing. The next chapter examines the knowledge sharing, innovation and business group affiliation relations.



## **Chapter 6 Knowledge Sharing, Innovation and the Role of Business Group Affiliation**

### **6.1 Introduction**

This chapter examines the relations between knowledge sharing and innovation and the moderating impact of business group affiliation on these relationships. It is argued that knowledge is created both within and outside the firms (Nonaka 1994). Specifically, interfirm collaborations with suppliers, buyers, universities, competitors and other firms enhance firms' knowledge base and innovative capabilities (Faems et al. 2005). Knowledge sharing activities have implications for firm performance and innovativeness (Hansen 1999; Argote and Ingram 2000; van Wijk et al. 2008). Firms that receive more knowledge and apply it to their own operations may have advantage over others. However, knowledge sharing is a difficult process, which requires close relations between parties and the consequences of knowledge flows may be different across contexts, such as multinational firms, strategic alliances, industrial districts or business groups (Mudambi and Navarra 2004; Bowman and Ambrosini 2003; Tallmann et al. 2004; Inkpen and Tsang 2005). Regarding the lattermost, with their strong ties among affiliates, they may confer advantages to member firms by creating a setting where knowledge flows are facilitated, which might be less available to independent firms. Consequently, in this chapter, first, the impact of explorative and exploitative knowledge sharing on innovation is explored, which followed by inquiry into the role of business group affiliation regarding these relationships.

In respect of the overall conceptualisation of this thesis, this chapter concerns knowledge sharing and innovation relations and the moderating impact of business group affiliation on this relationship. As aforementioned, knowledge is an important asset for firms in emerging economies regarding their innovation activities. Since many firms are not able to create knowledge within their boundaries, knowledge exchange becomes important in facilitating the creation of new knowledge and utilising the existing knowledge base. Also, knowledge exchange is one of the main features of business groups, whereby affiliates interact with each other to utilise knowledge in fostering innovation. This chapter is aimed at advancing the understanding of knowledge sharing, in the form of exploration, exploitation,

innovation and group affiliation relations, as explained in chapter two, through an empirical analysis of the collected survey data.

This chapter includes the theoretical basis of the research concepts and hypotheses. The second section provides a literature review about knowledge sharing, innovation and business group affiliation relations. In this section, first, explorative and exploitative knowledge sharing and their impact on innovation are examined. Then, the conditioning role of business group affiliation in the relationship between two types of knowledge sharing and innovation is discussed. Hypotheses are developed based on the knowledge sharing, group affiliation and innovation relations. This chapter continues with section three which explains the methodology used in this study and in the fourth section, the empirical results of the focal relations are presented. Finally, in section five, a discussion of the overall results in relation to the literature is provided along with the conclusion to the chapter.

## **6.2 Knowledge Sharing**

Since market for resources and production factors are not developed enough in emerging economies, firms benefit from sharing organisational resources, such as raw materials, production facilities, financial capital, information, experience and knowledge (Luo 2003). Of these resources, intangible ones are the main drivers of competitive advantage (Hall 1993). Moreover, among all intangible resources knowledge is regarded as one of the most strategically important resources of a firm (Grant 1996a). Organisational knowledge is defined as any information or skills that can be applied to firms' activities and it may be the specific scientific knowledge or skills that allow individuals to make effective decisions about firm processes (Anand et al. 2002).

Powell et al. (1996, p.118) emphasise the dynamic nature of knowledge and state that “*sources of innovation do not reside exclusively inside firms; instead, they are commonly found in the interstices between firms, universities, research laboratories, suppliers and customers*”. Interfirm relations provide firms with exploration and flow of knowledge from external sources such as, suppliers, buyers, customers, competitors, universities, alliance partners and government institutions

(Chiang and Hung 2010) and collaboration between firms enhance innovations (Tomlinson 2010; Tomlinson and Fai 2013). Firms extend their knowledge base by integrating new partners that have different and novel knowledge reservoirs (Huber 1991). Relations with other firms enable the transfer of tacit knowledge and reduce the R&D costs (Cao et al. 2006; Faems et al. 2005; Wang and Libaers 2016; Wu 2014). Firms' relationships in creating new products, minimise the risk associated with transaction problems and increase mutual learning, which facilitates innovation (Jean et al. 2014).

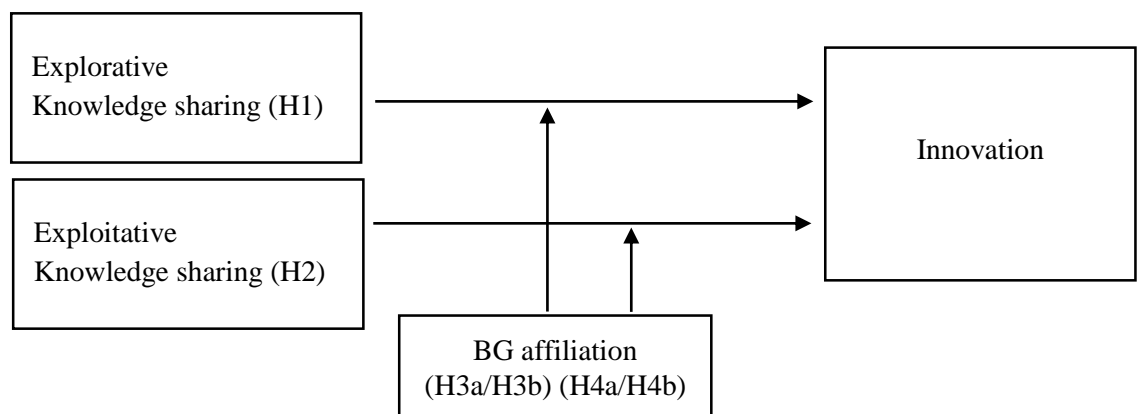
The literature generally suggests a favourable impact of knowledge sharing on innovation, firm performance and competitive advantage (van Wijk et al. 2008; Argote and Ingram 2000; Tsai 2001; Miller et al. 2007; Hansen 1999; 2002). For instance, Escribano et al. (2009) find a positive relationship between external knowledge flows from suppliers, buyers, competitors, universities, research institutions and innovation in Spanish firms. Leiponen (2005) shows a positive relationship between external knowledge sourcing from customers and competitors and the innovation performance of Finnish business service firms. Roper et al. (2010), comparing the U.S., U.K. and Spanish firms, argue that firm's external knowledge sources in the form of links with suppliers and customers have a positive impact on product innovations. Leiponen (2012) finds a positive influence of knowledge breadth (external knowledge sourcing from suppliers, buyers, competitors, universities etc.) on innovative performance of Finnish manufacturing and service firms. However, knowledge exchanges on innovation may have different results depending on the knowledge types and the context of a firm.

In this study, following March's (1991) conceptualisation, explorative and exploitative knowledge are used because both types of knowledge are closely related to innovation activities (Rosenkopf and Nerkar 2001; Faems et al. 2005). Moreover, business group affiliates may have advantages over independent firms in creating both types of knowledge with other affiliates and with firms outside their boundaries. In the next two parts, first, the concepts of explorative and exploitative knowledge sharing and their relations to innovation are elaborated. After this review, the concepts are examined in terms of business group affiliation along with the statement of the

hypotheses related to the effect of the two knowledge sharing strategies on innovation performance and the business group affiliation impact on this relationship.

### 6.2.1 Explorative and Exploitative Knowledge Sharing and Innovation

The proposed conceptual model in Figure 6.1 integrates knowledge sharing, business group affiliation and innovation relations in order to explore how knowledge sharing affects innovation and how this effect varies between group affiliated and independent firms. First, it is proposed that the extent to which firms share explorative and exploitative knowledge is positively associated with their innovation performance. Second, the business group, which is a dominant form of organisation in emerging economies, is considered to determine how affiliation with a group conditions the relationship between knowledge sharing and innovation. It is proposed that the knowledge sharing impact on innovation is higher for affiliates than for independent firms.



**Figure 6.1 Conceptual Model**

The two main concepts underpinning organisational learning are termed exploration and exploitation (March 1991). March (1991, p.71) defines exploration as including “*search, variation, risk taking, experimentation, play, flexibility, discovery, innovation*” and exploitation as pertaining to “*refinement, choice, production, efficiency, selection, implementation, execution*”. Exploitative learning includes the improvement of existing routines, refining existing capabilities, whilst explorative learning includes the development of new routines and ideas (Dixon et al. 2007; Brady

and Davies 2004; Auh and Menguc 2005). Organisational learning refers to the acquisition, creation, interpretation and storage of new knowledge (Auh and Menguc 2005; Cegarra-Navarro and Dewhurst 2007) and a firm's knowledge strategy determines its explorative and exploitative learning behaviour (Bierly and Chakrabarti 1996). Firms learn through modifying existing or creating new knowledge.

Exploration and exploitation practices refer to the different types of knowledge creation process. While exploration generates new knowledge that is different from a firm's knowledge base, exploitation refers to the use and development of existing knowledge and the creation of incremental knowledge (Levinthal and March 1993; Schulz 2001; Katila and Ahuja 2002; Hughes et al. 2007). Both knowledge exploration and exploitation enhance firms' intellectual capital (Ichijo 2002). Firms' search for explorative and exploitative knowledge is also conceptualised as 'distant search' that involves 'new capabilities' and 'local search' that builds on 'existing knowledge' (Li et al. 2008b; Kim et al. 2014; Mudambi and Swift 2014). This conceptualisation of exploration and exploitation includes novelty or familiarity of knowledge. In addition to these definitions, exploration and exploitation are considered as 'knowledge creation' and 'knowledge application', which involve the transformation of knowledge into products (Lavie and Drori 2012; Grant and Baden-Fuller 2004). Also, exploration of new and exploitation of existing knowledge are defined as search scope (breadth) and search depth (Katila and Ahuja 2002). In this study, after considering all the different conceptualisations (Gupta et al. 2006), exploration and exploitation are regarded as creating new knowledge and the utilisation of existing knowledge, respectively, in the context of interfirm knowledge sharing relationships.

Exploration and exploitation are 'mutually related' and 'build on each other' (Gilsing and Nooteboom 2006). That is, firms may pursue exploration and exploitation interchangeably (Holmqvist 2004). For instance, while exploration generates new opportunities, it also triggers exploitation of these (Rothaermel and Deeds 2004). Also, some level of exploitation should exist within firms in order to conduct exploration between firms. Moreover, exploration helps firms to internalise what they learn from other firms. Consequently, exploration and exploitation are interdependent (Holmqvist 2003; Cegarra-Navarro and Dewhurst 2007). For instance, when firms focus on exploitation, they may need to generate new knowledge for innovation or in case of

excessive exploration, they may need to utilise their existing knowledge (Holmqvist 2004). In early new product development firms pursue exploration in order to develop new knowledge and later they integrate this knowledge into the products through exploitation (Rothaermel and Deeds 2004).

Exploration of new knowledge and exploitation of existing knowledge are at the core of innovation (Garcia et al. 2003). Explorative and exploitative knowledge requirements are related to radical and incremental innovation (Benner and Tushman 2003; Jansen et al. 2006). Knowledge exploration is the addition of new characteristics to a product or developing new ones, whilst knowledge exploitation pertains to the development of existing products (Knott 2002). Exploration helps firms to develop new technology and products, whereas exploitation is conducted for the refinement of existing technology and products (Schulz 2001; Greve 2007; Rothaermel and Alexandre 2009; Danneels 2002). Exploration in new product developments includes technology and market knowledge, which is new to the firm and different from its current knowledge base. Exploitation involves searching for knowledge that provides deeper knowledge about a particular technology and market (Atuahene-Gima and Murray 2007). Moreover, firms' distant knowledge search generates more influential innovations and local knowledge search allows for developments in existing products (Wu and Shanley 2009). For instance, MNC subsidiaries generate new knowledge about the local market through exposure to a highly innovative environment and develop new products. In addition, they modify existing knowledge to apply it to existing products so as to adapt them for the local market (Ozsomer and Gencturk 2003).

Product and process innovations require exploitation of existing competencies through extension of existing knowledge and exploration of new ones through the acquisition of new knowledge and skills (Atuahene-Gima 2005). Examining the relationships between competence exploration-exploitation and innovation performance of Chinese electronics firms, Atuahene-Gima (2005) reveals that competence exploitation and exploration are positively related to incremental and radical innovation, respectively. Sidhu et al. (2007) conceptualise exploration and exploitation in terms of nonlocal and local knowledge search. High exploration orientation is defined as a greater amount of search in nonlocal domains, whereas, a

lesser amount of nonlocal search represents exploitation orientation. The authors examine the relations in the metal and electrical engineering industries and find a positive impact of high exploration orientation on innovation performance. Kim and Atuahene-Gima (2010), conceptualising explorative market learning as the acquisition of new knowledge and exploitative market learning as the utilisation of existing knowledge, show a positive impact of these strategies on new product differentiation and new product cost efficiency in Chinese manufacturing firms. Moreover, this beneficial impact of explorative and exploitative knowledge is sustainable, if firms apply other firms' knowledge to their own innovation activities (Rosenkopf and Nerkar 2001).

Whilst firms do benefit from explorative and exploitative knowledge search in terms of an increase in innovation performance, the literature underlines some negative effects along with the favourable results. For instance, firms that focus too much on explorative knowledge, lack the ability of exploitative knowledge development and integrating existing knowledge. On the other hand, continuous exploitation inhibits acquiring and creating new knowledge (Rothaermel and Alexandre 2009; Bierly and Daly 2007; Levinthal and March 1993; Cegarra-Navarro and Dewhurst 2007). Exploitative knowledge search allows for recombination of existing knowledge, however, too much focus on exploitation makes the acquisition of new knowledge difficult (Atuahene-Gima and Murray 2007). Similarly, explorative knowledge search provides new inputs for product development, however, new knowledge may involve risks and costs (Atuahene-Gima and Murray 2007). Lee et al. (2003) emphasise the negative sides of much exploitation and the difficulty of exploration. For instance, the authors argue that while too much technological exploitation may harm performance, with too much new technology exploration, positioning in the market becomes difficult since that discovered may be incompatible.

It is further argued that as firms conduct more exploration, exploitation of new explorative knowledge produces no innovations, because such activities become public goods and the created knowledge may exist elsewhere (Levinthal and March 1993; Gilsing et al. 2008). Excessive exploration prevents firms from capitalising on their existing knowledge and exploiting their own competences (McGrath 2001; He and Wong 2004). Also, integrating knowledge that is different to that of the firms'

knowledge base may be problematic (Phene et al. 2006). For instance, acquisitions provide acquirer firms with new knowledge and their technological knowledge uniqueness offers opportunities for explorative knowledge search of that firm. However, this technological knowledge uniqueness may also inhibit exploitative knowledge search of the acquirer firm. Acquirer firms may not conduct R&D activities, therefore, exploitation of knowledge may diminish (Phene et al. 2012). Hsu and Lim (2014) suggest that exploratory search through ongoing knowledge brokering beyond a certain point may not be beneficial in terms of innovation performance and support this idea examining the relationships in biotechnology firms.

Regarding exploitative learning, whilst this increases a firm's knowledge base, it loses its uniqueness, if it is produced and used continuously (Hughes et al. 2007; Yayavaram and Chen 2015). Firms' knowledge acquisition through local search generates knowledge close to their existing knowledge, however, the lack of distant explorative knowledge causes 'learning myopia' (Levinthal and March 1993; Phene et al. 2012). In this case, repetitive exploitation may inhibit knowledge exploration, whereas incremental exploitation can increase it since it triggers search intent for new knowledge (Piao and Zajac 2016). In a stable environment, since firms take advantage of their own knowledge base, overexploitation may not harm firm performance, however, in a dynamic environment firms' sticking to existing capabilities reduces the flexibility to adapt to changes. Under such circumstances, the inertia firms confront may negatively affect performance and innovation. In dynamic environments, knowledge exploration helps firms to adapt to the changing environment through enlarging their knowledge base and capabilities, hence those that do so can overcome the risk of negative performance effects (Wang and Li 2008). For instance, Yalcinkaya et al. (2007) examine the exploration and exploitation capabilities on the product performance of U.S. importers and find that exploration capabilities positively affect product innovation, whereas, exploitation capabilities have a negative effect. The authors argue that too much exploitation may hinder the aim for explorative capabilities and ideas.

The empirical research depicts negative and curvilinear effects of explorative and exploitative knowledge on innovation as well as positive impacts. Regarding which, Kim et al. (2014) investigate the effect of explorative (acquisition of new



knowledge as change in research expenses) and exploitative (improving existing knowledge as change in development expenses) knowledge search on exploratory innovation output (sales composition from search and investment due to new products) for Korean firms. The results show that explorative and exploitative knowledge acquisition have a negative impact on such output. Wang and Li (2008) examine explorative and exploitative search (outside firm and technological domains) of U.S. manufacturing firms and find that overexploration and overexploitation, which are measured as the difference between actual and predicted exploration, have a negative effect on innovation performance. Katila and Ahuja (2002), defining exploration and exploitation as search scope and search depth, examine the relationships between depth, scope and product innovation in robotics firms. The authors conclude that firms' search behaviour affects innovation performance differently, for whilst there is a curvilinear relationship between search depth and product innovation, the relationship between search scope and innovation is positively linear. Based on this evidence in the literature, it can be inferred that excessive explorative and exploitative knowledge may harm firm innovation.

Organisational learning can also be achieved between firms through relations with partners in the form of alliances, networks or other forms of collaborations. (Holmqvist 2003). For instance, the learning process in joint ventures can be achieved with partner interaction and knowledge exchange (Inkpen 2000). The two forms of learning, which are defined as exploration and exploitation, can also take place between firms (Holmqvist 2004). Interfirm learning allows firms to explore new opportunities and increase their knowledge base, thereby enhancing innovation performance. Exploitation may occur between firms by joint utilisation of experiences and similarly, exploration may be conducted between firms by joint experimenting. In sum, interorganisational learning process includes both exploration and exploitation (Holmqvist 2003).

Interorganisational learning is best achieved through recognising the value of external knowledge (Lane and Lubatkin 1998). That is, firms learn from knowledge transfers between partners (Holmqvist 2004) and conduct explorative and exploitative transfers to enhance their innovation. Explorative knowledge exchange refers to the application of external knowledge to generate new products and exploitative

knowledge flows include the application of external knowledge to develop existing products and improve processes (Bierly et al. 2009). In order to innovate, firms should explore new external knowledge sources in addition to exploiting external knowledge bases in depth (Foss et al. 2013). Im and Rai (2008, p.1283) define explorative knowledge sharing as the *“exchange of knowledge between firms in a long-term relationship to seek long-run rewards, focusing on the survival of the system as a whole, and pursuing risk-taking behaviours”* and exploitative knowledge sharing as *“the exchange of knowledge between firms in a long-term relationship to seek short-run rewards, focusing on the survival of the components of the system and pursuing risk-averse behaviours”*. Firms’ exploitation leads to incremental knowledge creation related to their existing knowledge; whereas exploration creates knowledge that is different (Arikan 2009). Explorative knowledge sharing reduces market uncertainties and enhances product and process innovations. Exploitative knowledge sharing reduces coordination costs and contributes to the refinement of existing products and services (Im and Rai 2008). Interfirm relations provide firms with explorative and exploitative knowledge, which are utilised in developing product and process innovations.

Explorative and exploitative knowledge exchanges are conducted in different settings, such as alliances, buyer-supplier relations, independent firm collaborations, business groups (Lavie and Rosenkopf 2006; Faems et al. 2005; Wu 2014; Lee et al. 2010; Yamakawa et al. 2011). For instance, a firm’s motivation to form an alliance could be to do with learning through exploiting an existing capability or exploring new opportunities (Koza and Levin 1998; Dittrich et al. 2007). Moreover, interfirm relations in alliances may be aimed at exploration of new knowledge, transferring partner’s new knowledge and exploitation of existing knowledge (Yang et al. 2011; Lavie et al. 2011; Grant and Baden-Fuller 2004). Exploitation helps partner firms to refine current products and processes, as well as reduce costs related to production, whereas exploration creates new knowledge that is different from the partner’s existing knowledge base (Hoang and Rothaermel 2010). Explorative and exploitative knowledge exchange among partners can be related to products, technologies and services (Lavie and Rosenkopf 2006). Exploration of new technology and exploitation of existing complementary assets through entering into alliances can improve firms’ product development (Rothaermel 2001a). Also, forming an alliance with existing or

new partners is another way of knowledge exploitation and exploration. Existing partners provide firms to use their current knowledge efficiently and new partners may provide new forms that cannot be acquired through existing relations (Lavie and Rosenkopf 2006).

These different forms of interfirm collaborations for explorative and exploitative exchanges are examined in the literature. Rothaermel (2001b) investigates how pharmaceutical and biotechnology firm alliances leverage knowledge and explore new knowledge through interfirm relations and the effect of this knowledge on new product development. The results show a positive effect of explorative and exploitative strategic alliances on such development. The author conclude that interfirm cooperation through alliances improves firms' product innovation. Yang et al. (2014a) argue that small firms generate new knowledge by forming exploration alliances and leverage existing knowledge through exploitation alliances with large firms. However, whilst exploration and exploitation alliances with large firms have a positive impact on small firms' valuation, the benefits from exploitative alliances may be higher than the benefits from explorative ones, because it may be easier to integrate partners' complementary knowledge. Examining pharmaceutical firms that enter into strategic alliances, Rothaermel (2001a) finds that exploitation ones have a stronger positive effect on incumbent firms' new product development than their exploration alliances. Beckman et al. (2004), conceptualising exploration and exploitation in interfirm relations as 'forming new relationships with new partners' and 'forming additional relationships with existing partners', respectively, in the context of alliances, suggest that new relations with new partners allow firms to expand their knowledge, whereas forming relations with existing ones provides firms with an extension of their existing knowledge.

Similarly, the aim of the exploitative collaborations with other firms, such as suppliers, buyers, customers, universities and research institutes, is the enhancement of the existing products. Exploitative collaborations help firms to leverage existing capabilities, develop existing technologies and products, whilst explorative collaborations are aimed at developing new products and capabilities (Faems et al. 2005). For instance, in the context of interfirm relations, Im and Rai (2008) investigate the impact of explorative and exploitative knowledge sharing of customer and vendor

firms on relationship performance in the logistics industry. The results show that while explorative knowledge sharing has a positive effect on relationship performance from a customer perspective, exploitative knowledge sharing has impact on this performance from both the customer and vendor perspectives. Chiang and Hung (2010) relate explorative and exploitative knowledge flows to open search breadth and depth, respectively, arguing that firms' interactions with suppliers, buyers and other institutions provide them with both types of knowledge flow. The authors' research on Taiwanese electronic product manufacturing firms reveal that search breadth and depth have a positive impact on radical and incremental innovation performance. Faems et al. (2005), measuring exploitative collaborations with supplier and customer relations and explorative ones regarding university and research institute relations, find a positive impact of exploitative collaborations on developing existing technologies and products, whereas explorative collaborations have a positive impact on new technologies and products. This research, in the context of various interfirm collaborations and independent firms, generally shows a favourable influence of knowledge exchanges on the innovation performance of firms.

However, the positive impact of explorative and exploitative knowledge exchanges may diminish when firms increase their search activities. For instance, Wu (2014) examines the effect of external knowledge search breadth (interactions with customers, suppliers, competitors, business groups and academic institutions) on product innovation in Chinese manufacture and service firms. The results show a curvilinear relationship between search breadth and product innovation. Laursen and Salter (2006) argue that firms' external relations with suppliers, buyers and other institutions positively affect their innovation performance. Examining U.K. manufacturing firms, the authors find that external search breadth (the number of external sources that firms rely upon for innovation) and search depth (the extent to which firms draw deeply on the different external sources) have a positive impact on innovation performance. However, this effect decreases as firms increase their search breadth and depth. In general, considering both the positive and diminishing impacts of explorative and exploitative knowledge flows through interfirm relations, it can be inferred that firms benefit from knowledge exchanges, although excessive knowledge flows beyond a point may harm firm innovation. Based on these arguments it is proposed that:

**Hypothesis 1:** Explorative knowledge sharing has a positive effect on firm innovation.

Similarly, with regards to exploitative knowledge,

**Hypothesis 2:** Exploitative knowledge sharing has a positive effect on firm innovation.

In addition to knowledge exchanges in interfirm relations, as presented above, business group affiliates utilise and generate knowledge both with other affiliates within the group and with their relations outside. Explorative and exploitative knowledge sharing activities may be conducted in both settings and affiliates' internal and external embeddedness may have a conditioning (favourable or negative) impact on the relationship between knowledge sharing and innovation. Also, from an examination of exploration and exploitation in the context of intra and interfirm networks, it is suggested that these knowledge exchange strategies may have different effects on innovation in different settings (Gupta et al. 2006; Coombs et al. 2009). Accordingly, in the following subsection the role of group affiliation in innovation and knowledge sharing is explained.

### **6.2.2 Explorative and Exploitative Knowledge Sharing and Affiliation**

As business groups are regarded as network forms of organisation (Granovetter 1995; Cuervo-Cazurra 2006; Podolny and Page 1998; Chang 2006) in which firms share their knowledge, experiences and resources with other affiliated firms, their behaviour may result in increases or differences in acquisitions of capabilities and accordingly, in their performance. Regarding which, Mahmood et al. (2011) examine the effect of network ties (buyer-supplier, equity and director) on the R&D capability acquisition of Taiwanese business group affiliates. The results show that buyer-supplier centrality increases this capability. Moreover, buyer-supplier ties are more valuable when the affiliate has equity and director ties. In a case study, Piana et al. (2012) show that in addition to shareholdings and interlocks, the intensity and persistence of the relations play an important role in the governance of Italian family business groups.

Explorative and exploitative knowledge sourcing can be conducted both internally and externally. For instance, multinational firms adapt their existing products to local markets in an exploitative way through using their parent's knowledge base internally. Also, they can conduct exploration activities, such as the development of new ideas, products and processes in the host country environment with local firms (Frost 2001). Similarly, in business groups, explorative and exploitative knowledge sharing can be conducted both internally with other affiliates and externally with firms outside the group for innovation (Rothaermel and Alexandre 2009). Business group affiliates share existing technologies in order to exploit those available more extensively within the group. New technologies, on the other hand, provide new knowledge for differentiating products. Also, groups' internal markets provide exploration of knowledge (Skold and Karlsson 2012).

Group affiliates also share explorative knowledge in order to integrate new technological knowledge that is different from their existing knowledge base (Lee et al. 2010). Regarding which, Korean business groups share explorative and exploitative knowledge among affiliates and disseminate this knowledge to overseas subsidiaries (Lee et al. 2010). Similar to the firms within a cluster, affiliated firms benefit from creating new knowledge for their innovation activities and utilising existing knowledge within their groups. For instance, Coombs et al. (2009) examine how a firm's location within and outside a cluster (location munificence) moderates the impact of exploration (knowledge search beyond the firm's local region) and exploitation (knowledge search within the firm's local region) on the innovation of U.S. biotechnology firms. The authors argue that firms embedded in more munificent locations benefit from both exploitation of local knowledge search and exploration of international knowledge search in terms of innovation performance.

Firms in emerging economies establish relationships with foreign firms to get access to knowledge from multinationals (Khan et al. 2015). That is, group firms establish relationships with foreign firms to acquire knowledge to enhance their innovation (Mahmood and Mitchell 2004; Chang et al. 2006). For instance, Liu (2012), examining Taiwanese suppliers' relationships with MNC buyers, elicit that suppliers' innovation capability is enhanced through the knowledge acquisition from a MNC buyer. Crone and Roper (2001) suggest that product, process, organisational and

strategic knowledge transfers from Northern Ireland's MNC subsidiaries to local suppliers improve suppliers' competitiveness in the host economy. Based on these arguments it is proposed that:

**Hypothesis 3a:** Business group affiliation positively moderates the relationship between explorative knowledge sharing and innovation.

On the other hand, the ties that link member firms may create structural and relational embeddedness of affiliated firms (Vissa et al. 2010), which "*refers to the fact that economic action and outcomes are affected by the structure of the overall network of relations*" (Granovetter 1992, p.33). The firm is "*embedded in networks of institutionalized relationships and these networks have a direct effect on the types of firms that develop, on the management of firms, and on organizational strategies*" (Hamilton and Biggart 1998, p.57). This embeddedness creates 'closeness in a relationship and intensive information exchange' (Andersson et al. 2001a). Uzzi (1996, p.674), as a result of a study on apparel firms, contend that embeddedness "*is an exchange system with unique opportunities relative to markets and that firms organized in networks have higher survival chances than do firms which maintain arm's-length market relationships*". For instance, in multinational firms, a subsidiary may be embedded in two networks of relationships, such as those within the MNC and external relations with the local market (Andersson et al. 2001b). A subsidiary's embedded external relationships with suppliers, buyers and customers provide it with knowledge from outside (Andersson et al. 2001a), which leads to innovation.

Similarly, firms affiliated with business groups are embedded in their internal and external relations and this idea of embeddedness may have two different effects regarding their social and economic settings. That is, group firms benefit from the embedded ties that affiliates have with other firms internally and outside the group, externally, through accessing knowledge and resources (Chen and Jaw 2014; Becker-Ritterspach and Bruche 2012). However, this embeddedness may be harmful since continuous relations may not create new resources for innovation (Uzzi 1997; Chung 2004; Tomlinson and Fai 2016). This negative effect of embeddedness is observed in the multinational firm literature. Research on knowledge flows among MNC subsidiaries suggest that while knowledge flows from sister subsidiaries and

headquarters do not contribute to innovation, knowledge sharing with local firms outside an MNC has a positive impact. This impact is attributed to the acquisition of new and various types of external knowledge, which enhance innovation performance (Almeida and Phene 2004; Phene and Almeida 2008; Yamin and Otto 2004).

The embedded relations within the group may not provide affiliates with novel knowledge for product and process innovations (Chittoor et al. 2009). Consequently, in addition to creating and sharing knowledge within the group, affiliates establish relations with independent firms in order to access to knowledge and facilitate R&D capabilities for innovation. Regarding which, continuous intrafirm knowledge flows in MNCs diminish the range of skills, knowledge and innovative productivity. These internal links may be beneficial if the subsidiaries develop distinctive capabilities. On the other hand, subsidiaries' (external) interfirm relations with local suppliers, customers, competitors and research institutions may be more beneficial in terms of innovation performance since they facilitate knowledge flows from different partners (Asmussen et al. 2013; Adenfelt and Lagerstrom 2006; Andersson et al. 2001a; Frost 2001). As a result, in addition to internal relations, firms should maintain them with external firms so as to acquire the necessary knowledge for enhancing their innovation (Yamin and Otto 2004; Asmussen et al. 2013). For instance, Lee et al. (2010) investigate the effect of explorative and exploitative technological knowledge exchange among affiliated firms and transfer of this knowledge to their foreign manufacturing subsidiaries on the subsidiary performance in the context of Korean chaebols. The results show that an affiliate's exploitative technological knowledge exchange with another affiliate has a positive effect on the performance of its foreign subsidiaries, whereas exploratory technological knowledge exchange with another affiliate has a negative effect. Hence, the counter hypothesis can be formulated as:

**Hypothesis 3b:** Business group affiliation negatively moderates the relationship between explorative knowledge sharing and innovation.

Firms' networks can provide them with new knowledge and also the ability to understand how to combine this with existing knowledge (Singh et al. 2016). Integrating knowledge to generate new knowledge from different parts of the organisation is an exploitative process. (Schulz 2001). Affiliates achieve such learning



through exchanging technological knowledge with other affiliates so as to deliver incremental innovation. Also, sharing exploitative knowledge in the buyer-supplier relationships allows them to utilise existing knowledge and to develop complementary technologies (Lee et al. 2010). In addition, business group firms produce technology for a specific firm within the group, which can be shared within the group and this technology sharing is a form of exchange of knowledge that contributes to product development (Skold and Karlsson 2012). However, while the dense relations among members of a business group may prevent firms from conducting explorative activities, cooperation between them can facilitate their exploitative activities, which will enhance their existing knowledge resources (Jansen et al. 2006). Accordingly, it is proposed that:

**Hypothesis 4a:** Business group affiliation positively moderates the relationship between exploitative knowledge sharing and innovation.

A high level of embeddedness may cause firms to share less as the knowledge they share becomes similar (Cowan et al. 2007). That is, social relations among affiliated firms may create an overembedded setting in which economic behaviour becomes inefficient (Chung 2004). Regarding, long standing group firms' embeddedness constrains affiliates' external search (Gubbi et al. 2015). In addition, whilst member firms can benefit from affiliation in terms of access to resources, their strategic and financial activities may be constrained by the core firm. Business group firms that pursue their own strategies may be more 'insulated' from competition in the capital, labour and product markets than independent ones. On the other hand, independent firms may pursue a more market oriented approach when searching for resources (Kim et al. 2010). As a result, sharing existing exploitative knowledge may not benefit an affiliated firm in terms of new product or process developments. Hence, the counter hypothesis can be stated as:

**Hypothesis 4b:** Business group affiliation negatively moderates the relationship between exploitative knowledge sharing and innovation.

In conclusion, business group affiliation is expected to confer an advantage to group affiliated firms by providing access to resources, knowledge, skilled employees

as well as training situated in affiliates, advantages that may be less available to unaffiliated or independent firms (Lamin and Dunlap 2011). Being affiliated to a business group is deemed advantageous for member firms in the inefficient markets of emerging economies, as the group facilitates resource and knowledge transfers among member firms. The relations associated with knowledge sharing, innovation and affiliation in this chapter are examined in the next sections, which provide the methodological approach used in this study and the results relating to the proposed hypotheses.

### 6.3 Methodology

As in chapter five, the data are again taken from the administered survey (see chapter three). In this section, firstly, the model is specified, before presenting the measurement of the variables, measurement model assessment (using exploratory and confirmatory factor analyses), examination of the common method variance and the testing of the nonresponse bias relating to this study.

#### Model Specification

$$\text{Innovation} = \beta_0 + \beta_1 \text{Firm size} + \beta_2 \text{Firm age} + \beta_3 \text{Industry} + \beta_4 \text{R\&D} + \beta_5 \text{Affiliation} + \beta_6 \text{Explorative KS} + \beta_7 \text{Exploitative KS} + \beta_8 \text{Explorative KS X Affiliation} + \beta_9 \text{Exploitative KS X Affiliation} + \varepsilon_i \quad (1)$$

In this model, first, the dependent variable innovation is regressed on the control variables firm size, firm age, industry and R&D. Subsequently, the independent variables affiliation, explorative, exploitative knowledge sharing and the moderation effect of affiliation are added. The possible endogeneity of the knowledge sharing variables is examined using the Durbin and Wu-Hausman tests, with the details and results being presented in Appendix 6.5. According to the results, the explorative and exploitative knowledge sharing variables are exogenous and hence, the main and moderation effects are analysed using the ordinary least squares (OLS) estimator. In the next subsection, the construction of the variables is discussed.

### 6.3.1 Variables

#### Dependent Variable

**Innovation:** The dependent variable used in this research is innovation. In the previous literature, innovation is measured through the number of product innovations (Tsai and Ghoshal 1998; Tsai 2001), developments or introductions of new products and processes (Molina-Morales and Martinez-Fernandez 2006; 2009; Su et al. 2009; Tomlinson 2010) and patents (Mahmood and Mitchell 2004; Chang et al. 2006; Belenzon and Berkovitz 2010; Hsieh et al. 2010). Among these measures, patent data receives much attention, because they are systematically compiled and have detailed information (Song et al. 2003). However, industrial differences in patenting behaviour, differences in patenting between large companies and smaller firms as well as the inability of patents covering all activities from R&D to innovation, are the shortcomings of the use of patents (Hagedoorn and Cloudt 2003).

Since patent data are not available for the sample firms, following Molina-Morales and Martinez-Fernandez (2009) and Tomlinson (2010), firm innovation is measured based on the subjective evaluation of respondents relating to introductions of product and processes. Product and process innovation distinction is used in the previous literature (Molina-Morales and Martinez-Fernandez 2006; 2009, Su et al. 2009; Tomlinson and Fai 2016). Product innovation refers to the development of a new product or the improvement of an existing. Process innovation pertains to the introduction of a new method of production, improvement in manufacturing flexibility or reduction in labour costs (Leiponen and Helfat 2010). Product innovation is measured with the items ‘introduction of new product lines and changes/improvements to existing product lines’. Process innovation is measured through the ‘introduction of new equipment/ technology in the production process, introduction of new input materials in the production process and introduction of organisational changes/ improvements made in the production process’. The measurement items relating to the innovation variable have been presented in Table 3.1 in chapter three. The respondents were asked to assess their firms’ innovation activities during the past three years on a Likert scale, ranging from 1= Not at all to 5= A great extent. An overall

measure for innovation is calculated based on the average of the product and process innovation items. The Cronbach's alpha value for the innovation variable is 0.86.

### **Independent Variables**

The independent variables used in this study are explorative and exploitative knowledge sharing along with business group affiliation. The measurement of these variables is explained below.

**Explorative and Exploitative Knowledge Sharing:** In this study knowledge sharing is considered as being the reciprocal flows between firms and their suppliers and buyers (Sammorra and Biggiero 2008). In the previous studies, knowledge sharing (transfer/flows) has been investigated regarding technologies, sales and marketing, product designs, distribution, know-how and R&D (Schulz 2001; Tsai 2002; Maurer et al. 2011; Gupta and Govindarajan 2000). Also, knowledge sharing has been examined according to the knowledge characteristics, including tacit, explicit, explorative and exploitative as well as the above domains (Hansen 1999; 2002; Im and Rai 2008; Lee et al. 2010). In this chapter, the explorative and exploitative knowledge types are used.

Explorative and exploitative knowledge are operationalised in various ways in the literature. In the context of interfirm relations, Lee et al. (2010) measure explorative knowledge exchanges as knowledge flows on new product and technologies, whereas exploitative knowledge exchanges are measured as flows in relation to improving existing product and production. Im and Rai (2008) conceptualise explorative knowledge sharing as the exchange of knowledge between firms in a long-term relationship and exploitative knowledge sharing as the knowledge exchanges in a short term one. Bierly and Daly (2007) measure knowledge exploration and exploitation in terms of the generation of new knowledge and the enhancement of the existing knowledge base, respectively.

In order to measure explorative and exploitative knowledge sharing, relevant items are adapted from the studies of He and Wong (2004) and Lee et al. (2010). Explorative knowledge sharing is measured with the items 'we share knowledge on:

development of new products, extending product range and entering new technology fields'. Exploitative knowledge sharing is measured with the items 'we share knowledge on: improving existing product quality, improving production flexibility and reducing production costs'. The measurement items related to the explorative and exploitative knowledge sharing variables have been provided in Table 3.1 in chapter three.

Similar to existing studies, knowledge sharing items are repeated for suppliers and buyers. For instance, Wu and Chen (2012) explore the knowledge acquisition capability from customers, competitors and suppliers. McEviliy and Marcus (2005) investigate information sharing with supplier and customer firms. Su et al. (2009) measure external partnerships as interactions with suppliers, customers, competitors, universities and research institutes. The respondents were asked to assess their knowledge sharing activities during the past five years on a Likert scale ranging from 1= Strongly disagree to 5= Strongly agree. To measure each knowledge sharing variable, an average of all the items for suppliers and buyers is calculated. Also, for group affiliated firms, an average of all the items related to within group knowledge sharing and outside group knowledge sharing (explorative and exploitative) is obtained. The Cronbach's alpha value for both the explorative and exploitative knowledge sharing variables is 0.91.

**Business Group Affiliation:** To make a distinction between business group affiliated and independent firms a dummy variable is used, which has been utilised in similar studies to indicate business group affiliation (Belenzon and Berkovitz 2010; Chang et al. 2006; Chittoor et al. 2015) and industrial district affiliation (Molina-Morales and Martinez-Fernandez 2003; 2004; 2010). The initial questionnaire before the pilot study included all the sections relevant to affiliated and independent firms, however, since this was not clear for the respondents, two questionnaires were prepared, one for each type. The affiliation information was confirmed with respondents and then the relevant questionnaire was sent. The question, 'Is your firm a part of business group (holding)' was retained in both questionnaires for making a comparison between the initial confirmation and the respondents' answers. Two questionnaires were dropped from the analysis since the affiliation information was

not clear. Firms that belong to a group are coded as 1, whereas those that do not take a value of 0.

### **Control Variables**

Control variables are used to capture factors defined as “*extraneous to the desired effect*” (Carlson and Wu 2012, p.414). These extraneous factors are controlled by “*partialling out variance associated with control variables*” in the examination of the relationships between other variables (Carlson and Wu 2012, p.415). In order to ensure the robustness of the study, several control variables, namely, firm size, firm age, industry and R&D, are used in this study.

**Firm Size:** Firm size may affect the knowledge transfer and innovation outcomes of an organisation, whereby larger firms possess greater and more heterogeneous resources (Maurer et al. 2011). Firm size is measured as the number of employees (Wu 2008; Perez-Luno et al. 2011).

**Firm Age:** Firm age may influence the ability of knowledge sharing relations; older firms may have an experience advantage through having established relationships with buyers, suppliers or competitors (Yli-Renko et al. 2001). Firm age is measured by the number of years since the founding date of the firm (Villena et al. 2011; Maurer et al. 2011).

**Industry:** Different industries may exhibit varying knowledge sharing patterns and accordingly, performance outcomes (Yli-Renko et al. 2001). A firm’s industry is determined by the three-digit ISIC codes based on the information on the ICI firm lists (1968, Series M, No.4, Rev.2). Then, a dummy variable is created with 1 representing medium technology industries (chemical & petroleum, basic metal, machinery & equipment) and 0 representing low technology industries (coal mining, food & beverages, textile, wood & furniture, paper).

**R&D:** Firms may develop a knowledge base through R&D activities (Lane and Lubatkin 1998). For instance, investment in them can provide new knowledge, thus enabling firms to acquire and assimilate related knowledge (Tallman et al. 2004) and

to enhance innovation performance (Hagedoorn and Wang 2012; Grimpe and Kaiser 2010; Leiponen 2012). R&D is measured according to the response to the question: 'Approximately what proportion of your firm's turnover (either direct budget or staff time) was spent on research or development activities (e.g. product, process, or design activities conducted either in-house or in collaboration) over the period 2008-2013?' (Tomlinson 2010).

### **6.3.2 Measurement Model Assessment, Common Method Variance and Nonresponse Bias**

The validity of the measurement model was assessed through exploratory and confirmatory factor analyses. A principal component factor analysis (PCF) was conducted with orthogonal (varimax) rotation, utilising the innovation and knowledge sharing (explorative, exploitative) variables (for full details see Appendix 6.1). The Cronbach's alpha values for the innovation, explorative knowledge sharing and exploitative knowledge sharing variables are 0.86, 0.91 and 0.91, respectively, which all exceed the minimum (0.7) acceptable threshold (Hair et al. 2010). Both convergent and discriminant validity were satisfied through confirmatory factor analysis (CFA), with the full details being presented in Appendix 6.2.

In order to assess the common method variance (CMV), Harman's one factor test was conducted with principal component factor and confirmatory factor analyses (Podsakoff et al. 2003). First, the test was conducted with two models in which all measures were loaded into a principal component factor analysis, where two and three factors emerged, with the largest factors accounting for 46.63% and 43.57% of the total variance in each model, respectively. Also, CMV was examined with confirmatory factor analysis through the marker variable technique. Whilst a slight bias was observed from this technique with one of the models, overall it is unlikely that the data used in the study suffer from common method variance (see Appendix 6.3 for full details).

To test for nonresponse bias, a t-test was conducted on the mean differences between the early and late respondents with regard to firm age, firm size, R&D, innovation and knowledge sharing variables (Armstrong and Overton 1977).

Regarding which, those who returned the questionnaire within the first four weeks (before the reminder emails) were considered early respondents. The results do not show any significant differences between early and late respondents, thus suggesting that nonresponse is not a concern in this study (see Appendix 6.4).

## 6.4 Results

In this section, the hypotheses proposed in this chapter, are tested through hierarchical moderated regression analysis with Stata (V14.2). First, the descriptive statistics and the relations between the variables with a correlation matrix are provided. Second, the results are presented along with a discussion of multicollinearity issue and relevant assumptions. Finally, the overall results of this chapter are discussed in relation to the literature in the discussion and conclusion section.

### 6.4.1 Descriptive Statistics and Correlations

An overview of the relations between the innovation, knowledge sharing and affiliation variables is provided with correlation analysis. Table 6.9 provides the descriptive statistics including the means, standard deviations and correlations of the variables used in the study. Also, the variance inflation factors (VIF) and Cronbach's alpha ( $\alpha$ ) values are reported.

**Table 6.9 Descriptive Statistics and Correlations**

Variables	Mean	SD	1	2	3	4	5	6	7	8
1.Innovation	3.29	0.79	1							
2.Explorative	3.48	0.78	0.24*	1						
3.Exploitative	3.53	0.82	0.17*	<b>0.81*</b>	1					
4.Affiliation	0.5	0.50	0.06	-0.08	-0.07	1				
5.Firm size	5.97	1.70	0.26*	0.19*	0.16*	0.12	1			
6.Firm age	33.43	16.51	0.10	0.20*	0.13	0.04	0.23*	1		
7.Industry	0.44	0.50	-0.07	0.03	0.07	-0.01	-0.14	0.05	1	
8.R&D	1.59	0.90	0.20*	-0.13	-0.09	-0.11	0.03	-0.07	-0.08	1
<b>VIF</b>			n.a.	6.37	6.10	1.05	1.15	1.11	1.04	1.05
<b>Cronbach's <math>\alpha</math></b>			0.86	0.91	0.91	n.a.	n.a.	n.a.	n.a.	n.a.

\*p< 0.1 (2-tailed) n.a.: Not available SD: Standard deviation VIF: Variance inflation factor

According to the correlation matrix, whilst weak, explorative and exploitative knowledge sharing are positively correlated with innovation. The positive correlation



between two knowledge sharing variables and innovation provides a first indication that such knowledge sharing may affect innovation performance positively. Also, firm size and R&D are positively related to innovation. The correlation between the explorative and exploitative knowledge sharing variables is high ( $r=0.81$ ,  $p<0.1$ ), therefore, this may cause a multicollinearity problem. In order to examine potential multicollinearity, the VIF (variance inflation factor) values were calculated for each independent variable and the results are discussed. The next part presents the results.

#### **6.4.2 Econometric Results**

Equation (1) was estimated using an OLS estimator, but before considering the results, it is first important to consider the diagnostic testing of the model (equation 1). First, omitted variable bias is noted, which occurs “*when the omitted variable is correlated with the included regressor*” and “*when the omitted variable is a determinant of the dependent variable*” (Stock and Watson 2015, p.229). To address this, Ramsey’s regression specification error test (RESET) for omitted variables was utilised (Cameron and Trivedi 2010). In the regression model, the p value is 0.07 ( $p>0.05$ ) and therefore, the model does not have omitted variable bias at 95% significance, however, at 90%, the model may require more variables or a higher order (quadratic component) terms. Consequently, in this study identification of omitted factors is considered to be a theoretical concern (Kohler and Kreuter 2012).

Secondly, multicollinearity is considered. Prior to the creation of interaction terms, independent variables (except BG affiliation dummy) are mean-centred to reduce the potential problem of multicollinearity (Aiken and West 1991; Cohen et al. 2003). However, there are still some indicators of multicollinearity in this study. First, as aforementioned, the correlation between the explorative and exploitative knowledge sharing variables is high ( $r=0.81$ ), which may cause a multicollinearity problem (Hair et al. 2010; Cohen et al. 2003). Second, when a full model is included with all the main effects and interaction terms (Tabachnick and Fidell 2014), the individual variable VIF values range from 1.04 to 6.37, with a maximum value of 6.37 for explorative knowledge sharing and one of 6.10 for exploitative knowledge sharing, which may be problematic in a small sample size study (Hair et al. 2010; Cohen et al. 2003).

In this study, explorative and exploitative knowledge sharing constructs are well defined and reliable, however they have strong correlation. Also, the VIF values, which range from 1.04 to 1.64, except for the full model, are smaller than the recommended maximum value of 10 (Hair et al. 2010). Despite the multicollinearity problems, moderated regression analysis is a valid method for testing fit as a moderation, if the conceptualisation of the theory includes a moderation perspective (Venkatraman 1989). Consequently, explorative and exploitative knowledge sharing variables were retained, main effects and interaction terms were entered separately into the different models and the results were interpreted, accordingly (Yang et al. 2014a; Leiponen and Helfat 2010; Becerra et al. 2008; Chen et al. 2011). Heteroscedasticity was examined with a Breusch-Pagan test and a White's test (Cameron and Trivedi 2010), the details of these with the results are given in Appendix 6.6 along with a comparison of the homoscedasticity-only-standard and heteroscedasticity-robust standard errors (Stock and Watson 2015).

Table 6.11 presents the analysis results for the effect of knowledge sharing on innovation and the moderating role of affiliation on the impact of such sharing on innovation. Unstandardised coefficients and standard errors are reported. Model 1 contains all the control variables, whilst in model 2, the affiliation and explorative knowledge sharing variables are added. Model 3 includes the exploitative knowledge sharing variable, whereas model 4 has the interaction term between explorative knowledge sharing and affiliation and in model 5, the interaction term between exploitative knowledge sharing and affiliation are entered. Also, a full model (model 6) includes all the variables and interactions used, however, because of the multicollinearity concerns explained above, only the models with separate knowledge sharing variables and interaction terms are discussed.

**Table 6.11 Results of the Regression Analysis**

<b>Dependent variable: Innovation</b>						
	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>	<b>Model 6</b>
<b>Control variables</b>						
Firm size	0.109** (0.042)	0.086** (0.042)	0.094** (0.042)	0.078* (0.041)	0.089** (0.042)	0.079* (0.041)
Firm age	0.003 (0.004)	0.001 (0.004)	0.002 (0.004)	0.001 (0.004)	0.002 (0.004)	0.001 (0.004)
Industry	-0.031 (0.138)	-0.045 (0.135)	-0.051 (0.138)	-0.040 (0.133)	-0.046 (0.137)	-0.028 (0.134)
R&D	0.167** (0.076)	0.200*** (0.076)	0.184** (0.076)	0.185** (0.075)	0.176** (0.076)	0.187** (0.075)
<b>Independent variables</b>						
Affiliation		0.124 (0.135)	0.103 (0.137)	0.107 (0.133)	0.095 (0.136)	0.106 (0.133)
Explorative KS <b>H1</b>		<b>0.243*** (0.092)</b>		0.385*** (0.110)		0.583*** (0.218)
Exploitative KS <b>H2</b>			<b>0.150* (0.087)</b>		0.252** (0.105)	-0.214 (0.202)
<b>Interactions</b>						
Explorative KS X Affiliation <b>H3a/H3b</b>				<b>-0.409** (0.183)</b>		-0.568* (0.298)
Exploitative KS X Affiliation <b>H4a/H4b</b>					<b>-0.302* (0.179)</b>	0.163 (0.283)
_cons	2.278*** (0.303)	1.522*** (0.407)	1.788*** (0.405)	1.078** (0.447)	1.451*** (0.449)	1.146** (0.453)
<b>R<sup>2</sup></b>	0.106	0.159	0.131	0.194	0.152	0.203
<b>Adj R<sup>2</sup></b>	0.076	0.116	0.086	0.145	0.100	0.139
<b>F</b>	3.493***	3.659***	2.912***	3.958***	2.944***	3.189***
<b>N</b>	123	123	123	123	123	123
<b>VIF (mean)</b>	1.05	1.08	1.06	1.23	1.21	2.90

Unstandardised regression coefficients. Standard errors in parentheses.

Legend: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01. Two tailed tests.

Model 1 pertains to the effects of the control variables. Firm size ( $b = 0.109$ ,  $p < 0.05$ ) and R&D ( $b = 0.167$ ,  $p < 0.05$ ) have positive and significant impacts on innovation, thus indicating that larger firms and firms with high R&D are more likely to generate innovations. On the other hand, firm age and industry have no impact on this.

Hypothesis 1 predicts a positive impact of explorative knowledge sharing on innovation, with the result showing that such sharing has a positive and significant impact on innovation ( $b = 0.243$ ,  $p < 0.01$ ) and therefore, hypothesis 1 is supported. Hypothesis 2 proposes a positive relationship between exploitative knowledge sharing and innovation, with model 3 examining this relationship. The findings indicated that such knowledge sharing has a positive and significant impact on innovation ( $b = 0.150$ ,  $p < 0.1$ ), thus supporting hypothesis 2. The results of hypothesis 1 and hypothesis 2 suggest that firms with high explorative and exploitative knowledge sharing behaviour generate more innovations.

Before giving the results relating to moderation hypotheses, an issue is clarified regarding the distinction between form (when the dependent variable is jointly determined by the interaction of the independent and the moderator variable) and strength (when the predictive ability of the independent variable differs across different moderator groups) of the moderation (Venkatraman 1989). If a moderator modifies the strength of the relationship between the independent and dependent variables, a subgroup analysis is performed to determine the strength of the effects of groups (moderator groups) on the relationship between these variables. If a moderator modifies the form of the relationship between the independent and dependent variables, the interaction terms are identified and their links to the latter are generated (Prescott, 1986).

Whilst using interaction terms involves examination of the form of a relationship, subgroup analysis (testing whether a statistically significant difference exists in the value of correlation coefficients between the independent and dependent variables across the relevant groups) of a total sample examines its strength (Prescott 1986; Venkatraman 1989). In the case of moderated regression analysis with interaction terms, the form of the relationship is tested and a significant coefficient of

the interaction term provides evidence of the effect of a fit between the moderator and independent variables on the dependent variable (Venkatraman 1989).

If a moderator is not significantly related to the dependent and independent variables as well as not interacting with the latter, it is considered a ‘homologiser’ and effects the strength of the relationship between the independent and dependent variables across the subgroups. A moderator variable that influences the form of a relationship “*implies a significant interaction between the moderator and predictor variables*” (Prescott 1986, p.334). If a moderator variable is significantly related to the dependent or independent variables or both, it is considered a ‘quasi moderator’, whereas if the opposite is true, then it is seen as being a ‘pure moderator’ (Prescott 1986).

Before determining whether the moderator is a homologiser or a quasi/pure moderator, it is important to clarify its conceptualisation (Venkatraman 1989). In this study, the moderator variable affiliation is considered to form the relationship between knowledge sharing and innovation. Following Prescott (1986), the type of the moderator variable (affiliation) was determined using a moderated regression analysis. First, there is a significant interaction between affiliation and explorative knowledge sharing and between affiliation and exploitative knowledge sharing. Second, the effect of affiliation on innovation is insignificant and thus, the variable affiliation is a pure moderator, which effects the form of the relationship between knowledge sharing and innovation. A moderated regression analysis is appropriate for the purpose of testing the mentioned effects.

Hypotheses 3a-3b and 4a-4b examine the moderating effect of group affiliation on the relationship between knowledge sharing and innovation. Hypothesis 3a proposes that the impact of explorative knowledge sharing on innovation is higher for group affiliated firms than for independent firms. To test this hypothesis, the interaction term between explorative knowledge sharing and affiliation was added in model 4. The coefficient for the interaction term is negative and significant ( $b = -0.409$ ,  $p < 0.05$ ), which thus means that hypothesis 3a is not supported. That is, contrary to expectations, group affiliation negatively moderates the relationship between explorative knowledge sharing and innovation, thus supporting alternative hypothesis

3b and suggesting that explorative knowledge sharing has a stronger effect on innovation for independent firms than for affiliated ones. Hypothesis 4a predicts a positive moderation of group affiliation on the relationship between exploitative knowledge sharing and innovation. In model 5, the interaction term between exploitative knowledge sharing and affiliation was added. However, the coefficient for the interaction term is negative and significant ( $b = -0.302$ ,  $p < 0.1$ ), thus meaning that hypothesis 4a is not supported. Similar to hypothesis 3b, group affiliation negatively moderates the relationship between exploitative knowledge sharing and innovation, thereby supporting the alternative hypothesis 4b and suggesting that exploitative knowledge sharing has a stronger effect on innovation for independent firms than for affiliated ones.

Table 6.12 provides the results relating to product and process innovation. In the regression with the product innovation, while firm size and R&D have positive effects, firm age and industry have no impact on product innovation. Regarding the main effects, only explorative knowledge sharing positively affects product innovation, whilst group affiliation negatively moderates the relationship between explorative knowledge sharing and product innovation in the full model. In the regression deploying process innovation, firm size and R&D have a positive impact. Moreover, explorative and exploitative knowledge sharing have a positive and significant effect on process innovation. Finally, group affiliation negatively moderates the relationship between both explorative and exploitative knowledge sharing and process innovation.

**Table 6.12 Results of the Regression Analysis (Product and Process Innovation)**

Dependent variable: Product innovation							Dependent variable: Process innovation					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
<b>Control variables</b>												
Firm size	0.147*** (0.045)	0.130*** (0.045)	0.138*** (0.046)	0.124*** (0.045)	0.135*** (0.046)	0.125*** (0.045)	0.086* (0.049)	0.060 (0.049)	0.067 (0.049)	0.046 (0.048)	0.058 (0.049)	0.047 (0.048)
Firm age	0.004 (0.005)	0.003 (0.005)	0.004 (0.005)	0.003 (0.005)	0.004 (0.005)	0.003 (0.005)	0.001 (0.005)	-0.000 (0.005)	0.001 (0.005)	-0.000 (0.005)	0.001 (0.005)	-0.000 (0.005)
Industry	0.045 (0.149)	0.035 (0.148)	0.034 (0.150)	0.038 (0.147)	0.037 (0.150)	0.056 (0.147)	-0.079 (0.157)	-0.099 (0.153)	-0.111 (0.156)	-0.094 (0.150)	-0.102 (0.154)	-0.085 (0.152)
R&D	0.158* (0.082)	0.183** (0.083)	0.169** (0.083)	0.172** (0.082)	0.165* (0.083)	0.175** (0.082)	0.176* (0.089)	0.218** (0.088)	0.198** (0.089)	0.192** (0.087)	0.184** (0.088)	0.193** (0.088)
<b>Independent variables</b>												
Affiliation		0.107 (0.147)	0.087 (0.148)	0.095 (0.147)	0.083 (0.149)	0.094 (0.146)		0.136 (0.153)	0.115 (0.155)	0.114 (0.151)	0.102 (0.154)	0.113 (0.152)
Explorative KS		<b>0.175*</b> <b>(0.100)</b>		0.277** (0.122)		0.603** (0.239)		<b>0.291***</b> <b>(0.103)</b>		0.458*** (0.124)		0.573** (0.245)
Exploitative KS			0.076 (0.094)		0.130 (0.115)	-0.351 (0.222)			<b>0.200**</b> <b>(0.098)</b>		0.332*** (0.117)	-0.124 (0.227)
<b>Interactions</b>												
Explorative KS X Affiliation				-0.293 (0.202)		<b>-0.597*</b> <b>(0.328)</b>				<b>-0.489**</b> <b>(0.208)</b>		-0.553 (0.340)
Exploitative KS X Affiliation					-0.161 (0.195)	0.326 (0.311)					<b>-0.395*</b> <b>(0.200)</b>	0.057 (0.320)
_cons	2.012*** (0.325)	1.460*** (0.444)	1.750*** (0.439)	1.142** (0.493)	1.570*** (0.491)	1.256** (0.498)	2.431*** (0.367)	1.521*** (0.479)	1.794*** (0.472)	1.046** (0.511)	1.370*** (0.513)	1.081** (0.521)
<b>R<sup>2</sup></b>	0.132	0.156	0.139	0.171	0.144	0.189	0.064	0.126	0.099	0.167	0.129	0.170
<b>Adj R<sup>2</sup></b>	0.103	0.113	0.094	0.121	0.092	0.125	0.031	0.080	0.052	0.115	0.075	0.103
<b>F</b>	4.487**	3.578**	3.116**	3.398**	2.761**	2.934**	1.973*	2.747**	2.090*	3.238***	2.394**	2.525**
<b>N</b>	123	123	123	123	123	123	121	121	121	121	121	121

Unstandardised regression coefficients. Standard errors in parentheses. Legend: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01. Two tailed tests.

## 6.5 Discussion and Conclusion

### 6.5.1 Discussion

The purpose of this chapter has been to explore the impact of knowledge sharing, particularly explorative and exploitative knowledge, on innovation and whether this relationship is contingent on organisational context, namely, business group affiliation. Initially, a positive impact of explorative and exploitative knowledge sharing on innovation were proposed and then it was argued that business group affiliation moderates this relationship in favour of affiliated firms. In addition, a possible negative moderation impact of affiliation was considered. Table 6.14 presents the overall results relating to the hypotheses proposed in this chapter. In general, the results reveal that whilst explorative and exploitative knowledge sharing have a positive impact on innovation, business group affiliation negatively moderates the relationship between these two dimensions of knowledge and innovation. Except for the unexpected negative moderation impact of affiliation, the results are generally consistent with the research that examines the impact of explorative and exploitative knowledge sharing on innovation (Atuahene-Gima 2005; Sidhu et al. 2007; Kim and Atuahene-Gima 2010; Rothaermel 2001b; Chiang and Hung 2010; Faems et al. 2005) and firm performance (Yang et al. 2014a; Im and Rai 2008; Zhan and Chen 2013) in the literature.

**Table 6.14 Overview of the Hypotheses and Findings**

		Hypotheses	Findings
Main effects		Main effects of Knowledge sharing	
Explorative KS	<b>H1</b> (+)	Explorative knowledge sharing has a positive effect on firm innovation.	<b>Supported</b>
Exploitative KS	<b>H2</b> (+)	Exploitative knowledge sharing has a positive effect on firm innovation.	<b>Supported</b>
Interaction		Moderation effect of Business group affiliation	
Explorative KS X Affiliation	<b>H3a/</b> <b>H3b</b> (-)	Business group affiliation <b>positively (negatively)</b> moderates the relationship between explorative knowledge sharing and innovation.	<b>H3b supported</b>
Exploitative KS X Affiliation	<b>H4a/</b> <b>H4b</b> (-)	Business group affiliation <b>positively (negatively)</b> moderates the relationship between exploitative knowledge sharing and innovation.	<b>H4b supported</b>

In line with the results in similar studies, regarding hypotheses 1 and 2, explorative and exploitative knowledge sharing have a positive impact upon



innovation. This result extends the previous research and is consistent with the idea that the creation of knowledge through exchanges with partners and its application to innovation activities is essential in an emerging economy context, because knowledge is a scarce resource and that both explorative and exploitative knowledge exchanges between firms lead to increased innovation performance. For instance, explorative collaborations with partners help firms to create novel products and exploitative collaborations allow further development of existing products (Faems et al. 2005). In order to innovate, firms require both explorative knowledge in the form of new ideas and exploitative knowledge through deepening their existing knowledge base (Chiang and Hung 2010). Also, in this study, the positive impact of explorative knowledge sharing on product innovation supports the idea that explorative knowledge exchange is one of the main drivers of product innovations (Yalcinkaya et al. 2007; Un and Asakawa 2014). On the other hand, both explorative and exploitative knowledge sharing have a positive impact on process innovation, meaning that such innovations that are incremental in nature may require more exploitative knowledge exchanges (Un and Asakawa 2014), whilst explorative flows may contribute to more radical ones.

Contrary to the expectation of a positive moderation effect of business group affiliation, a negative interaction impact between affiliation and two types of knowledge sharing on innovation was observed in relation to hypotheses 3b and 4b. This negative moderation impact of affiliation may be as a result of overembeddedness of affiliate firms within their network (Granovetter 1992). Similar to the subsidiaries' knowledge networks of internal embeddedness within the MNC and external embeddedness within the host country (Achcaoucaou 2014; Kostova et al. 2016), business group affiliates have relations within and outside the group. That is, while group affiliates interact with headquarters (holding company) and other affiliates, they also have exchange relations with suppliers, buyers, universities and other institutions outside their boundaries. Both relations provide affiliates with knowledge that allows them to exchange knowledge with other affiliates. If group firms rely only on knowledge exploitation within the group, they may confront overembeddedness, caused by inertia and increasing similarity of knowledge within the group (Granovetter 1992; Gobbo and Olsson 2010; Lavie and Rosenkopf 2006).

Network relations among affiliates facilitate the exchange of exploitative knowledge, however, exploitative knowledge flows among themselves or with firms outside the group may hinder the creation of explorative knowledge owing to this inertia (Phene et al. 2012; Hughes et al. 2007). Whilst strong relations among affiliated firms facilitate knowledge exploitation, these ties may inhibit the exploration of new knowledge (Wright et al. 2005). Consequently, firms may not develop new capabilities from existing knowledge if they cannot appreciate that their own capabilities are no longer effective (Lane and Lubatkin 1998). This inertia, in turn, prevents firms from developing innovative activities that require new knowledge or better utilisation of existing knowledge. Also, strong ties in a network of relations allow firms search for explorative knowledge, as these ties help them to overcome the tacitness of knowledge in exploration. However, long duration of relations may hinder innovation in that whilst strong ties may be useful up to a point, they may have a negative impact, whereby new knowledge cannot be created and shared. Therefore, firms should create new knowledge outside their network (Gilsing and Duysters 2008).

Group firms take advantage of their internal capital markets, which provide resources and knowledge for innovation, however, since independent firms lack access to these group advantages, they may need to be more effective in their knowledge exchange relationships with other firms in order to innovate. As a result, the inertial effect that groups have may be less observed in independent firms. That is, independent firms may be more effective in exploiting knowledge from other firms thanks to their low embeddedness in such environments (Chittoor et al. 2009). Group firms' closed network may be beneficial in terms of integration of similar knowledge, however, this knowledge may not lead to increased innovation performance (Mors 2010). Regarding which, research which examines the affiliation impact on technological, financial resources and internationalisation relationship, shows that affiliated firms are less likely to benefit from resources in product market internationalisation (Chittoor et al. 2009). It is argued that since affiliates benefit from internal markets for products as well as capital resources within their group, accessing international technological and financial resources is more important and higher for independent firms than for those affiliated with business groups (Chittoor et al. 2009).

Ongoing relations may also inhibit innovation by creating resource redundancy owing to the use of existing knowledge (Mahmood et al. 2013). A firm's old internal knowledge may be more reliable and established than new knowledge in creating innovation, however, if a firm uses the former knowledge, it cannot experience new knowledge, which may be the source of new product innovations (Katila 2002). For instance, when exploitative knowledge exchanges become embedded within a group, firms can integrate knowledge effectively, however, this knowledge base may become obsolete and exploration of new knowledge may become costly (McNamara and Baden-Fuller 1999). Firms affiliated with groups may focus on local search within the group from other affiliates instead of acquiring new knowledge from outside firms (Mahmood et al. 2013), which will not create new opportunities for new innovations. Regarding which, Gubbi et al. (2015) show that Indian group firms are less likely to undertake international search than independent ones after industry specific institutional changes. The argument is that institutional changes may constraint the groups' ability to adapt to changes and the inertial impact of affiliation may limit search behaviour.

A firm's overexploration or overexploitation of knowledge can also harm innovation performance (Wang and Li 2008; Uotila et al. 2009). Owing to their group and reputational advantages, such as government privileges, financial capital, internal markets and research facilities (Chang et al. 2006), affiliated firms may have more knowledge exploration opportunities with other firms, especially with foreign firms, however, explorative knowledge might not lead to an increase in innovations, if the cost of knowledge exceeds benefits in cases of overexploration (Wang and Li 2008). Similarly, when there is overexploitation of knowledge, firms' capabilities may turn into 'core rigidities', whereby the embedded knowledge that has been beneficial in the past is no longer useful for new product and process developments (Leonard-Barton 1992).

### **6.5.2 Conclusion**

This chapter has investigated knowledge sharing and innovation relations along with the moderation impact of business group affiliation on these relationships. In general, while explorative and exploitative knowledge sharing have positive impacts

on innovation, affiliated firms are less likely to benefit from such exchanges in terms of innovation performance. Whilst both explorative and exploitative knowledge exchanges generally enhance innovation performance, for the specific case of affiliated firms, they negatively impact innovation performance.

These results have some implications for knowledge sharing and innovation relations in emerging economies in the particular context of business groups. Firstly, interfirm interactions with partners to exchange knowledge contribute to innovation performance. Since knowledge is a scarce resource for emerging economy firms, creation and application of knowledge in innovation activities requires exchange relations as well as its production within firms. Specifically, explorative and exploitative knowledge exchanges, which represent the creation of new and utilisation of existing knowledge with other firms, respectively, have an important role to play in product and process innovations. Consequently, both types of interfirm knowledge flows are necessary for new product and process developments or improving existing innovations. Secondly, in this study, a negative moderation impact of affiliation on the relationship between knowledge sharing and innovation is observed, because in a networked and embedded setting, affiliates may not be able to create novel knowledge or the use of existing knowledge might have caused negative effects. In order to overcome the negative impacts of inertial disadvantages, group firms may interact with other firms outside their boundaries, because their closed network may not be beneficial when the relations are highly embedded. Specifically, they should focus more on explorative knowledge exchanges with new partners and pay attention to utilising existing knowledge within and outside the group more effectively for product and process innovations.

## **Chapter 7 Conclusion**

This chapter provides contributions of the thesis, a summary of the main findings, the implications of the research for business and policy along with its limitations and suggestions for further research. In the first section, the research gap in the literature and contributions are addressed. Subsequently, in section two, the conceptual arguments presented in chapter two and the main findings of chapters four, five and six are summarised. In section three, the implications of the research for business and policy makers are outlined. The fourth section presents the limitations of the study and also contains the suggestions for future research.

### **7.1 Research Gap and Contributions**

It has been argued that social capital, knowledge exchange and innovation relations differ depending on the contexts in which firms operate (Inkpen and Tsang 2005). Social capital and knowledge sharing are the main characteristics of independent firms as well as business group affiliates in emerging economies, particularly where knowledge is a scarce resource and firms need to create knowledge with their partners for their innovation activities. The literature is well documented in terms of the facilitating role of social capital in knowledge flows and knowledge impacts on innovation. However, the relations between the concepts proposed in this thesis are not fully captured within the context of business groups in the literature. In this thesis, the relevant context is the business group, which is a prevalent form of organisation in emerging economies and this research was aimed at filling this gap in the literature by exploring the mentioned relations in the context of the group affiliation. In addressing this research gap, this thesis includes a sample of affiliated and independent firms in order to enhance the understanding of whether firms build social capital to facilitate knowledge sharing, utilise knowledge exchanges for innovation and how the effects of social capital and knowledge exchanges differ according to the organisational context. Moreover, despite business group literature being rich in terms of the performance impacts of affiliation, research on group affiliated firms' interaction within and outside the group remains scant. Consequently, this thesis also had the goal of addressing this lacuna by considering a subset of affiliated firms and examining knowledge sharing as well as social capital relations

from the perspective of affiliated ones. In doing so, this research makes contributions to the relevant literature on business groups, social capital and knowledge sharing.

This thesis makes a contribution to the literature by examining the social capital, knowledge sharing and their interactions with business group affiliation in an emerging economy. One of the contributions that this study makes is investigating the contingent value of social capital. Building social capital for knowledge exchanges is an important way of conducting business in emerging economies. However, its value may be more obvious when firms operate in a networked setting. This research has revealed that whilst social interaction and shared vision have a positive impact on knowledge sharing, trust has a negative impact. For the specific case of affiliated firms, trust and shared vision have a positive impact on knowledge sharing, whereas social interaction has no impact. Another contribution of this study is the examination of the contingent impact of knowledge sharing. According to the resource based view, the effect of resources on firm performance is best understood when the relevant context is considered. Regarding which, the outcomes of this study show that explorative and exploitative knowledge sharing have a positive impact on innovation, however, for the specific case of affiliated firms, it negatively affects innovation performance. A third contribution is related to the examination of affiliated firm behaviour. The findings from this study have added the existing literature on business groups by investigating affiliates' within and outside group knowledge sharing and social capital relations.

## **7.2 Findings**

This thesis has addressed social capital, knowledge exchange and business group affiliation relations. In chapter two, an overview of the research concepts and relations between them was provided. In that chapter, it was conceptually explained that firms utilise social capital and knowledge exchanges, however, it was further proposed that their impact may depend on the context, in this case, business group affiliation. In chapters four, five and six, the arguments presented in chapter two were elaborated upon along with empirical examination of the relevant research framework in each chapter.

In chapter four, literature on several characteristics of Turkish business groups was provided. Also, based on the general business group literature the performance impact of affiliation was reviewed. Moreover, it was proposed that group affiliates may have different relations with sister affiliates and with firms outside the group. The results have shown that affiliated and independent firms do not differ in terms of performance and innovation, however, for affiliated firms, social capital and knowledge sharing relations differ according to the within and outside group distinction. That is, in general, affiliated firms engage in tacit and explicit knowledge sharing and have trustworthy relations with their sister affiliates more than they do with firms outside the group. Also affiliated firms benefit from holding company knowledge flows and make decisions related to several areas after consulting the holding company. These results suggest that the performance differences between affiliated and independent firms are still inconclusive, however, there is a group impact in that affiliates refer to others within the group before approaching firms outside their boundaries. The results of this chapter provided a foundation for the next empirical chapters, which examined social capital, knowledge and affiliation relations in detail.

In chapter five, it was argued that knowledge sharing between firms is facilitated by social capital and affiliated firms utilise it in terms of knowledge exchanges more than independent ones. It has been found that firms' social interaction and shared vision among themselves have a positive impact on knowledge exchange, however, trust between firms has a negative effect on knowledge sharing. On the other hand, business group affiliates' trust and shared vision have a positive effect on knowledge sharing, however, affiliation does not affect the social interaction and knowledge sharing relationship. In line with the results which shows group affiliates' within and outside group social interaction and trust relations in chapter four, affiliation did not moderate the relationship between social interaction and knowledge sharing, however, it positively moderated the relationship between trust and knowledge sharing in chapter five.

In chapter six, the existing research on explorative and exploitative knowledge exchange was extended, where it was argued that the contribution of knowledge exchanges to innovation may differ according to group affiliation. It was revealed that whilst explorative and exploitative knowledge sharing have a positive impact on

innovation, business group affiliation negatively moderates the relationships between the two types of knowledge sharing and innovation. This result shows that explorative and exploitative knowledge exchanges have a negative effect on group affiliates' innovation. Particularly, group firms' embedded knowledge sharing relations within the group and established links with firms outside their boundaries diminish their innovation performance. In line with the results which shows affiliated and independent firm differences in terms of performance and innovation in chapter four, the examination of knowledge sharing, innovation and affiliation relations in chapter six did not show a direct impact of group affiliation on innovation. However, it did emerge that it negatively moderates the knowledge sharing and innovation relationship.

One of the most important result of this thesis is the negative impact of trust on knowledge sharing. Similar to other emerging economies, in Turkey, social capital is a way of maintaining business relationships with partners. Firms are mainly owned by families and these families are responsible for their firms' management. These families maintain business relations with known partners. Extensive trust between firms leads to less knowledge sharing which may be a result of embedded business relationships with existing partners. The existing trustworthy relationships with partners do not lead to knowledge sharing, on the contrary, creates a redundancy owing to the exchange of similar knowledge. This continuous sharing of similar knowledge with their existing partners may depict the inefficient utilisation of social capital.

Another significant outcome of this thesis is the negative impact of explorative and exploitative knowledge sharing on innovation for business group affiliated firms. Turkish business groups are mainly controlled and managed by the founding families. These families are dominant in strategic decisions of holdings and affiliates are responsible for day-to-day operations. This family dominant nature of groups, holdings' strategic policies and control mechanisms may constraint affiliates' efficiency in utilising resources and adaptation to changing environments, therefore, this negative impact of explorative and exploitative knowledge sharing may be the result of this inflexibility of affiliates in adapting to changes in their environments. Independent firms are more autonomous and flexible in their strategic decisions, that



is, the breadth of their partnerships might help them effectively utilise the resources for their innovative activities.

One of the ways that business groups access to resources and knowledge is to internationalise through foreign direct investments or mergers and acquisitions. After liberalisation, despite the Turkish state's reforms and regulations, groups' internationalisation remained low. Also, their highly diversified structure prevented them from competing in foreign markets. Accordingly, their innovation activities might have remained low because of their insufficient acquisition of new knowledge and utilisation of existing knowledge in the development of new products. Also, business groups mainly diversified into unrelated businesses. Their diversification strategies might have prevented them from sharing resources and skills, because for better exploration and exploitation of resources and knowledge, a collaboration among multiple affiliates is necessary. This would be difficult to achieve when groups diversify into unrelated businesses, although the affiliates are not unrelatedly diversified.

### **7.3 Research Implications**

This research has some implications for business strategy and policy. First of all, firms use social capital relations with other firms as a means for knowledge flows. Social capital's importance is obvious in emerging economies, because establishing long term business relations is generally possible through social relations that firms develop. In addition, these relations facilitate knowledge exchanges. However, firms should be cautious when utilising social capital as excess relations with ongoing firms may provide them with redundant resources. Moreover, the results on knowledge sharing and innovation relations suggest that for firms, it is important to interact in order to obtain knowledge, learn from each other and innovate, in general. Firms' knowledge strategy determines their innovation success, because knowledge is one of their most strategic resources of a firm. However, since it is difficult to access knowledge, firms' strategy may be the long term relationships they establish with their partners in transferring and utilising it.

In addition to the above, the findings of this research provide insights into business groups' management. Business group affiliated firms benefit from their relations with sister affiliates within the group in terms of knowledge sharing and social capital. Their strategy in pursuing relations with other affiliates reflects their normal routine, because they operate under a holding company, which controls all affiliates through several mechanisms. The social capital that groups develop with other firms within and outside the group facilitates their knowledge sharing. This result shows that managers of group firms may use their group reputation and recognition in developing social capital for knowledge exchanges within and outside their group. However, considering the overall firms in an emerging economy, the affiliation benefit in terms of knowledge sharing and innovation relationship turns negative, because the embedded relations within and outside their boundaries would appear not to be beneficial in terms of knowledge exchanges. Managers should be aware both group benefits and potential harm, for whilst they can leverage the linkages that group firms develop with other firms in their knowledge exchanges, these may not always enhance their capabilities in innovation activities.

In this study, a negative impact of explorative and exploitative knowledge sharing on innovation for business group affiliated firms is found. This result has implications beyond the level of firms and suggests that business groups may not contribute positively to innovativeness and therefore, wider economic development. Also, this result raises questions about the impact of business groups on national level and economic development more generally. The paradox related to groups' performance impact is that in some of the countries with more developed institutions, affiliates perform better than the independent firms, whereas, in other countries where institutions are underdeveloped, they perform worse. Therefore, there are different opinions about their benefits to national economies and accordingly, about their futures. While in some countries the decline of the groups is expected, some others support their formation. Consequently, the negative impact raises the question as to whether the groups should be dismantled or restructured. However, groups continue to dominate the economic activity in emerging economies and in some countries, groups restructure themselves to become more efficient. Turkish business groups, which were founded before liberalisation, continued to operate despite the reforms and improvements in markets. Also, regulations during the liberalisation period did not

reduce the formation of new groups and the diversification of the older groups in general. Since business groups are persistent in Turkey and affiliated firms utilise resources, such as knowledge, less effectively than independent firms in this study, policy makers should encourage these groups to perform internal reforms which will improve their performance and innovation activities. Also, Turkish business groups have mainly diversified into unrelated areas. This diversified nature of groups might reduce the extent of resource and knowledge sharing, therefore, government should persuade groups to reduce their business scope. However, they should be aware that groups may want to maintain their existence and so this re-focusing could be possible through aiding groups to invest in related areas so that group firms create synergies through sharing similar resources.

The managers and owners of these holdings should be aware that strategies that they pursue cause negative consequences because of embeddedness in their own environments. Strong ties between affiliates and holding companies might embed affiliated firms into a setting where obligations play an important role in firms' strategies and decision making. Holdings' strategic policies and control mechanisms should not constraint affiliates' efficiency in utilising resources and adaptation to changing environments. In this case, the holdings' role in group and affiliate level strategies can be reconfigured. Managers should restructure their relations within and outside their boundaries and be more effective in acquiring, creating knowledge from internal and external environments for their innovation activities. They can also exit industries which do not create value or acquire well performing firms. However, independent firms should be aware that in case of a poor performance, groups and affiliates may be less attractive for them to form partnerships.

This study shows some similarities and differences to other research in emerging economies regarding the impact of knowledge sharing and the moderating role of group affiliation. Research on firms and business groups in other emerging economies show that exploration and exploitation of knowledge is essential for firm performance in these economies and organisational settings have negative as well as positive moderating roles in firms' strategy and performance relationships (Su et al. 2011; Zhan and Chen 2013). For the specific case of business groups, studies reveal that performance impact of affiliation is inconclusive; it is positive in some emerging

economies, on the other hand, in some other, a negative impact is observed despite the lack of well-functioning institutions (Khanna and Rivkin 2001; Carney et al. 2011). Moreover, whilst knowledge exchanges enhance innovation, in some cases, groups negatively affect knowledge sharing and performance relations similar to the outcomes in the present research (Lee et al. 2010).

#### **7.4 Limitations and Future Research**

In this section, several limitations to this study and suggestions for future research are acknowledged. First, the measurement of dimensions of social capital has been evaluated in terms of social interaction, trust and shared vision. This operationalisation may not have captured the various aspects of the three dimensions of social capital (Wu 2008). Different measures or levels of social capital could have different impacts on knowledge exchange relations, such as operationalisation of relational capital in the form of trust at the individual-individual level or measurement of the structural dimension with a better operationalisation of social interaction (Li 2005; Zaheer et al. 1998; Noorderhaven and Harzing 2009).

Secondly, the results in the empirical chapter, which examined knowledge, innovation and affiliation relations, may be different from the outcomes of the research conducted in developed economies owing to various conceptualisations of explorative and exploitative knowledge as well as the specification of the unit of analysis, such as individual, firm and interfirm levels (Gupta et al. 2006). In this study, explorative and exploitative knowledge exchanges are conceptualised based on novel and existing knowledge utilisation, which are extensively applied to research on developed economy firms. Consequently, it is likely that the results would differ if these two knowledge sharing types are measured differently (Gupta et al. 2006). That is, compared to firms in developed economies, firms in emerging economies may have different characteristics in the creation, exchange and application of this knowledge to innovation activities (Su et al. 2009; Zhan and Chen 2013).

Thirdly, this study does not involve differentiating various types of groups, such as vertical or horizontal connections within groups (Yiu et al. 2007). It is possible that various types of groups have different impacts on social capital, knowledge

sharing and innovation relations. In addition, the examined relations may change depending on group size, group diversification or firm diversification, in general. Fourth, the arguments in this study have been tested in single country context. There is the possibility that emerging economies also differ among themselves in terms of social capital, knowledge exchange and innovation relations. Also, in some emerging economies, the moderating impact of business group affiliation on knowledge sharing and innovation relations may be related to the development of economic institutions that substitute for the groups' internal markets (Chittoor et al. 2015).

In addition, survey based research may suffer from self-reported data. For this study, the managers' judgements regarding knowledge sharing, social capital, performance and innovation were relied upon in this respect. Also, because of the cross-sectional nature of the data, the causation may run from innovation to knowledge sharing as well as from knowledge sharing to social capital. Whilst these matters were controlled in the relevant empirical chapters, given the possibility of managerial sense-making and reverse causality, the findings should be interpreted cautiously (Tomlinson and Fai 2016; 2013).

Given the limitations in this study presented above, several avenues are suggested for further research. First, further investigation could include different measures of the structural, relational and cognitive dimensions of social capital. For instance, tie strength may be another indicator of relational social capital, which might capture knowledge redundancy or overembeddedness (Li 2005). Second, since knowledge is a scarce resource in emerging economies, future research may include other relevant knowledge conceptualisations, such as exchanges in marketing know-how, R&D capabilities, management systems (Gupta and Govindarajan 2000; Colpan 2010) as well as the various conceptualisations of explorative and exploitative knowledge exchanges, which have mostly been examined in the developed economy context. Third, in relation to business groups, a subgroup analysis could be conducted that captures the effect of various characteristics of groups, such as size or diversification. Future research might involve including more detailed measurement of group affiliation and the impacts of different types of groups, as member-member relations may change according to the various types. Fourth, social capital, knowledge and innovation relations could be investigated in other emerging economies, where

business groups are the dominant form of organisation or in specific industries, such as high technology. Finally, a more qualitative approach could investigate interfirm relations deeper so as to uncover the impact of business group affiliation on such relations.

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## Appendix

### Appendix 3.1 Questionnaire for the Business Group Affiliated Firms

Cover Letter for both questionnaires:

#### **TURKISH FIRMS SURVEY 2014**

I am a doctoral researcher at the University of Bath, School of Management in the United Kingdom who is conducting an academic research under the supervision of Professor Michael Mayer and Associate Professor Phil Tomlinson.

This survey is a part of my doctoral research. In this survey, I am particularly interested in capturing knowledge sharing and innovation activities of Top 500 and second largest 500 firms which are affiliated and non-affiliated with a Turkish holding / business group.

Your participation in this survey is completely voluntary and will contribute to the success of my research. If you like to receive a report summarising the main findings of this research, please complete the details in the last page of this questionnaire.

#### **Guidelines for Completion**

Ideally, the questionnaire should be completed by a general manager or senior executive who has an appreciation of the issues of knowledge sharing, interfirm relations and innovation. Given the different subject issues it may be necessary for that person *to liaise with other people* in your company on particular questions.

The questionnaire should take approximately 20 minutes to complete. Completed questionnaires will be *analysed in the strictest confidence* and only aggregated results will be published. The views of individuals or companies will not be divulged.

If you have any questions about the questionnaire or this research, please do not hesitate to contact me (contact details below)

Thank you for your help in this research.

Yours sincerely

Ozlem Ozen

University of Bath, School of Management, Bath, BA2 7AY, United Kingdom

## SECTION 1: YOUR FIRM'S STRUCTURE

**This section includes some general questions about your firm's structure.**

**1. Is your firm affiliated with a Turkish holding/ business group (e.g. Koc Holding, Sabanci Holding, Zorlu Group etc.)?**

☐ Yes ☐ No

**2. If "yes", please indicate the name of the holding / business group (Optional)**

.....

**3. In which year was your firm established? .....**

**4. How many employees are there in your firm?**

☐ Less than 50 ☐ 50-99 ☐ 100-149 ☐ 150-249 ☐ 250-499 ☐ 500-999  
☐ 1000-1999 ☐ 2000-4999 ☐ 5000-9999 ☐ 10000 or more

**5. Does your firm engage in business in other countries (e.g. foreign direct investment, export activities etc.)?**

☐ Yes ☐ No

**If 'YES' please indicate below (please tick if both apply):**

☐ Export ☐ Foreign direct investment

**6. What is your firm's main sector?**

	SECTOR		SECTOR
331	Manufacture of wood and wood and cork products, except furniture	313	Beverage industries (alcoholic and non-alcoholic)
332	Manufacture of furniture and fixtures, except primarily of metal	341	Manufacture of paper and paper products
351	Manufacture of industrial chemicals	323	Manufacture of leather and fur products
324	Manufacture of footwear, except rubber or plastic	355	Manufacture of rubber Products
342	Printing, publishing and allied industries	210	Mining and quarrying
362	Manufacture of glass and glass products	382	Manufacture of machinery, except electrical
361	Manufacture of pottery, china and earthenware	385	Manufacture of professional, scientific and medical instruments and supplies
354	Manufacture of miscellaneous products of petroleum and coal	381	Manufacture of fabricated metal products
372	Non-ferrous metal basic industries	384	Manufacture of transport equipment
371	Iron and steel basic industries	353	Petroleum refineries
352	Manufacture of other chemical products	356	Manufacture of plastic products
321	Manufacture of textiles	369	Manufacture of other non-metallic mineral products
383	Manufacture of electrical machinery, apparatus, appliances and supplies	314	Tobacco manufactures
400	Electricity, Gas and Water	312	Food manufacturing not elsewhere classified
311	Food manufacturing	390	Other Manufacturing Industries
322	Manufacture of wearing apparel, except footwear		

## SECTION 2: YOUR FIRM'S INNOVATION ACTIVITIES

This section includes questions about your firm's innovation activities.

**7. Please indicate the extent to which your firm has introduced product and/ or process innovations over the last 3 years.**

**1= Not at all 2= Low 3= Moderate 4= Very 5= A great extent**

	Not at all	Low	Moderate	Very	A Great Extent
	1	2	3	4	5
Introduction of new product lines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Changes/ improvements to existing product lines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Introduction of new equipment/ technology in the production process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Introduction of new input materials in the production process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Introduction of organisational changes/ improvements made in the production process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**8. Has your firm introduced new products that were novel to the industry/ main market in the last 3 years?**

☐ Yes      ☐ No

**9. Has your firm introduced new processes that were novel to the industry/ main market in the last 3 years?**

☐ Yes      ☐ No

**10. Please evaluate your firm's average overall performance relative to the other firms in your industry (sector) over the last 2 years.**

**1= Much worse 2= Somewhat worse 3= About the same 4= Somewhat better 5= Much better**

	Much Worse	Somewhat Worse	About the Same	Somewhat Better	Much Better
	1	2	3	4	5
Return on Sales	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Return on Assets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Return on Investment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Profit Growth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sales Growth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Market Share Growth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



**11. Approximately what proportion of your firm's turnover (either direct budget or staff time) was spent on Research or Development activities (e.g. Product, Process, or Design activities conducted either in-house or in collaboration) over the period 2008-2013?**

☐ 0-20%   ☐ 21-40%   ☐ 41-60%   ☐ 61-80%   ☐ 81-100%

**12. Approximately what proportion of your staff in top and middle management level are university graduates?**

☐ 0-20%   ☐ 21-40%   ☐ 41-60%   ☐ 61-80%   ☐ 81-100%

**13. Please indicate below which category best describes the decision making authority that your firm has in terms of the following areas on the left hand side of the table. (The term 'holding company' refers to the company at the top.)**

	Category 1	Category 2	Category 3	Category 4	Category 5
	By the holding company without consulting your firm	By the holding company after consulting your firm	Equal influence in decision making	By your firm after consulting with the holding company	By your firm without consulting with the holding company
Product range	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Research and Development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Marketing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Production capacity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Manufacturing technology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
General management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**14. The following statements relate to the value of new knowledge. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
	1	2	3	4	5
We are able to identify and absorb external knowledge from other firms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We can successfully integrate existing knowledge with new knowledge acquired from other firms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We can successfully exploit the new integrated knowledge into concrete applications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### SECTION 3: YOUR FIRM'S RELATIONSHIPS WITHIN THE HOLDING / BUSINESS GROUP

This section includes questions about your firm's knowledge sharing activities and relations with firms WITHIN the holding / business group (with firms that are AFFILIATED with your holding).

15. The following statements relate to your firm's knowledge sharing on managerial and manufacturing processes with other firms *over the last 5 years*. Please indicate the level of your agreement.

1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree

	With Suppliers within the holding					With Buyers / Customers within the holding				
We share knowledge on market trends and opportunities	1	2	3	4	5	1	2	3	4	5
We share knowledge on managerial techniques	1	2	3	4	5	1	2	3	4	5
We share knowledge on management systems and practices	1	2	3	4	5	1	2	3	4	5
We share knowledge associated with product designs	1	2	3	4	5	1	2	3	4	5
We share knowledge associated with manufacturing and process designs	1	2	3	4	5	1	2	3	4	5
We share knowledge on the technical aspects of products	1	2	3	4	5	1	2	3	4	5

16. Please indicate the extent to which the holding company has provided your firm with knowledge on the following items *over the last 5 years*. (The term 'holding company' refers to the company at the top.)

1= Not at all 2= Low 3= Moderate 4= Very 5= A great extent

	Not at all	Low	Moderate	Very	A Great Extent
	1	2	3	4	5
Knowledge about technology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowledge about sales and marketing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowledge about competitor and supplier strategies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**17. The following statements relate to your firm's knowledge sharing on products with other firms over the last 5 years. Please indicate the level of your agreement. 1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	With Suppliers within the holding					With Buyers / Customers within the holding				
We liaise and share knowledge in the development of new products	1	2	3	4	5	1	2	3	4	5
We share knowledge on extending the product range	1	2	3	4	5	1	2	3	4	5
We share knowledge on entering new technology fields	1	2	3	4	5	1	2	3	4	5
We share knowledge on improving existing product quality	1	2	3	4	5	1	2	3	4	5
We share knowledge on improving production flexibility	1	2	3	4	5	1	2	3	4	5
We share knowledge on reducing production costs	1	2	3	4	5	1	2	3	4	5

**18. The following statements relate to your firm's social relationships with other firms over the last 5 years. Please indicate the level of your agreement. 1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	Suppliers within the holding					Buyers / Customers within the holding				
Our middle and senior level managers spend a considerable amount of time on social events with:	1	2	3	4	5	1	2	3	4	5
There are not intensive network between our firm and:	1	2	3	4	5	1	2	3	4	5
Our middle and senior level managers spend a considerable amount of time on business related events (training, seminars etc.) with:	1	2	3	4	5	1	2	3	4	5

**19. The following statements relate to your firm's relationships with other firms. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	Suppliers within the holding					Buyers / Customers within the holding				
You never have the feeling of being misled in business relationships with:	1	2	3	4	5	1	2	3	4	5
Until they prove that they are trustworthy in business relationships you remain cautious when dealing with:	1	2	3	4	5	1	2	3	4	5
You cover everything with detailed contracts while dealing with:	1	2	3	4	5	1	2	3	4	5
You get a better impression the longer the relationships you have with:	1	2	3	4	5	1	2	3	4	5

**20. The following statements compare your firm's vision with those of other firms. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	Suppliers within the holding					Buyers / Customers within the holding				
Your firm shares the same vision as your:	1	2	3	4	5	1	2	3	4	5
Your firm does not share similar approaches to business dealings as your:	1	2	3	4	5	1	2	3	4	5
Your firm shares compatible goals and objectives with:	1	2	3	4	5	1	2	3	4	5
Your firm does not share similar corporate culture and management style as your:	1	2	3	4	5	1	2	3	4	5

#### SECTION 4: YOUR FIRM'S RELATIONSHIPS OUTSIDE THE HOLDING / BUSINESS GROUP

**This section includes questions about your firm's knowledge sharing activities and relations with firms OUTSIDE the holding / business group (with firms that are NOT AFFILIATED with your holding).**

**21. The following statements relate to your firm's knowledge sharing on managerial and manufacturing processes with other firms *over the last 5 years*. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	With Suppliers outside the holding					With Buyers / Customers outside the holding				
We share knowledge on market trends and opportunities	1	2	3	4	5	1	2	3	4	5
We share knowledge on managerial techniques	1	2	3	4	5	1	2	3	4	5
We share knowledge on management systems and practices	1	2	3	4	5	1	2	3	4	5
We share knowledge associated with product designs	1	2	3	4	5	1	2	3	4	5
We share knowledge associated with manufacturing and process designs	1	2	3	4	5	1	2	3	4	5
We share knowledge on the technical aspects of products	1	2	3	4	5	1	2	3	4	5

**22. The following statements relate to your firm's social relationships with other firms *over the last 5 years*. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	Suppliers outside the holding					Buyers / Customers outside the holding				
Our middle and senior level managers spend a considerable amount of time on social events with:	1	2	3	4	5	1	2	3	4	5
There are not intensive network between our firm and:	1	2	3	4	5	1	2	3	4	5
Our middle and senior level managers spend a considerable amount of time on business related events (training, seminars etc.) with:	1	2	3	4	5	1	2	3	4	5

**23. The following statements relate to your firm's knowledge sharing on products with firms over the last 5 years. Please indicate the level of your agreement.**  
**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	With Suppliers outside the holding					With Buyers / Customers outside the holding				
We liaise and share knowledge in the development of new products	1	2	3	4	5	1	2	3	4	5
We share knowledge on extending the product range	1	2	3	4	5	1	2	3	4	5
We share knowledge on entering new technology fields	1	2	3	4	5	1	2	3	4	5
We share knowledge on improving existing product quality	1	2	3	4	5	1	2	3	4	5
We share knowledge on improving production flexibility	1	2	3	4	5	1	2	3	4	5
We share knowledge on reducing production costs	1	2	3	4	5	1	2	3	4	5

**24. The following statements relate to your firm's relationships with other firms. Please indicate the level of your agreement.**  
**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	Suppliers outside the holding					Buyers / Customers outside the holding				
You never have the feeling of being misled in business relationships with:	1	2	3	4	5	1	2	3	4	5
Until they prove that they are trustworthy in business relationships you remain cautious when dealing with:	1	2	3	4	5	1	2	3	4	5
You cover everything with detailed contracts while dealing with:	1	2	3	4	5	1	2	3	4	5
You get a better impression the longer the relationships you have with:	1	2	3	4	5	1	2	3	4	5

## SECTION 5: GENERAL QUESTIONS ABOUT YOUR FIRM

**This last section includes some general questions about your firm's ability to store knowledge, institutional support and corporate social responsibility.**

**25. The following statements relate to you firm's knowledge storage. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neither agree nor disagree</b>	<b>Agree</b>	<b>Strongly Agree</b>
	1	2	3	4	5
Much of our organisation's knowledge is contained in manuals, databases, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our organisation uses patents and licenses as a way to store knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our organisation embeds much of its knowledge in structures, systems and processes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our organisation's culture (stories, rituals) contains valuable ideas, ways of doing business, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The knowledge that we use is stored mostly in individuals' memory	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**26. The following statements explore the support your firm receives from other firms and institutions. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neither agree nor disagree</b>	<b>Agree</b>	<b>Strongly Agree</b>
	1	2	3	4	5
Your firm has received support for Research and Development (R&D) activities from other firms and/ or institutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You and/ or your employees have received specific business related training by other firms and/ or institutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your firm has received benefits from research activities carried out by other firms and/ or institutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**27. The following statements focus on your firm's corporate social responsibility. Please indicate the level of your agreement.**

**1=Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5=Strongly agree**

	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neither agree nor disagree</b>	<b>Agree</b>	<b>Strongly Agree</b>
	1	2	3	4	5
The socially responsible manager must place the interests of the society over the interest of the firm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The fact that corporations have great economic power in our society means that they have a social responsibility beyond the interests of their shareholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
As long as corporations generate acceptable shareholder returns, managers have a social responsibility beyond the interests of shareholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**28. What is your average rate of turnover over the past 5 years for top and middle management (executives, managers, supervisors)?**

☐ Less than 3%   ☐ 3-8%   ☐ 9-14%   ☐ 15-20%   ☐ Over 20%

**29. What is your current job title? .....**

**30. How long have you been at the present company? .....**

**Thank you for taking time to complete this questionnaire.**



## Appendix 3.2 Questionnaire for the Independent Firms

### SECTION 1: YOUR FIRM'S STRUCTURE

This section includes some general questions about your firm's structure.

**1. Is your firm affiliated with a Turkish holding/ business group (e.g. Koc Holding, Sabanci Holding, Zorlu Group etc.)?**

☐ Yes ☐ No

**2. If "yes", please indicate the name of the holding / business group (Optional)**

.....

**3. In which year was your firm established? .....**

**4. How many employees are there in your firm?**

☐ Less than 50 ☐ 50-99 ☐ 100-149 ☐ 150-249 ☐ 250-499 ☐ 500-999  
☐ 1000-1999 ☐ 2000-4999 ☐ 5000-9999 ☐ 10000 or more

**5. Does your firm engage in business in other countries (e.g. foreign direct investment, export activities etc.)?**

☐ Yes ☐ No

**If 'YES' please indicate below (please tick if both apply):**

☐ Export ☐ Foreign direct investment

**6. What is your firm's main sector?**

	SECTOR		SECTOR
331	Manufacture of wood and wood and cork products, except furniture	313	Beverage industries (alcoholic and non-alcoholic)
332	Manufacture of furniture and fixtures, except primarily of metal	341	Manufacture of paper and paper products
351	Manufacture of industrial chemicals	323	Manufacture of leather and fur products
324	Manufacture of footwear, except rubber or plastic	355	Manufacture of rubber Products
342	Printing, publishing and allied industries	210	Mining and quarrying
362	Manufacture of glass and glass products	382	Manufacture of machinery, except electrical
361	Manufacture of pottery, china and earthenware	385	Manufacture of professional, scientific and medical instruments and supplies
354	Manufacture of miscellaneous products of petroleum and coal	381	Manufacture of fabricated metal products
372	Non-ferrous metal basic industries	384	Manufacture of transport equipment
371	Iron and steel basic industries	353	Petroleum refineries
352	Manufacture of other chemical products	356	Manufacture of plastic products
321	Manufacture of textiles	369	Manufacture of other non-metallic mineral products
383	Manufacture of electrical machinery, apparatus, appliances and supplies	314	Tobacco manufactures
400	Electricity, Gas and Water	312	Food manufacturing not elsewhere classified
311	Food manufacturing	390	Other Manufacturing Industries
322	Manufacture of wearing apparel, except footwear		

## SECTION 2: YOUR FIRM'S INNOVATION ACTIVITIES

This section includes questions about your firm's innovation activities.

**7. Please indicate the extent to which your firm has introduced product and/ or process innovations over the last 3 years.**

**1= Not at all 2= Low 3= Moderate 4= Very 5= A great extent**

	Not at all	Low	Moderate	Very	A Great Extent
	1	2	3	4	5
Introduction of new product lines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Changes/ improvements to existing product lines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Introduction of new equipment/ technology in the production process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Introduction of new input materials in the production process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Introduction of organisational changes/ improvements made in the production process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**8. Has your firm introduced new products that were novel to the industry/ main market in the last 3 years?**

☐ Yes      ☐ No

**9. Has your firm introduced new processes that were novel to the industry/ main market in the last 3 years?**

☐ Yes      ☐ No

**10. Please evaluate your firm's average overall performance relative to the other firms in your industry (sector) over the last 2 years.**

**1= Much worse 2= Somewhat worse 3= About the same 4= Somewhat better 5= Much better**

	Much Worse	Somewhat Worse	About the Same	Somewhat Better	Much Better
	1	2	3	4	5
Return on Sales	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Return on Assets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Return on Investment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Profit Growth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sales Growth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Market Share Growth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**11. Approximately what proportion of your firm's turnover (either direct budget or staff time) was spent on Research or Development activities (e.g. Product, Process, or Design activities conducted either in-house or in collaboration) over the period 2008-2013?**

☐ 0-20%   ☐ 21-40%   ☐ 41-60%   ☐ 61-80%   ☐ 81-100%

**12. Approximately what proportion of your staff in top and middle management level are university graduates?**

☐ 0-20%   ☐ 21-40%   ☐ 41-60%   ☐ 61-80%   ☐ 81-100%

**13. The following statements relate to the value of new knowledge. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neither agree nor disagree</b>	<b>Agree</b>	<b>Strongly Agree</b>
	1	2	3	4	5
We are able to identify and absorb external knowledge from other firms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We can successfully integrate existing knowledge with new knowledge acquired from other firms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We can successfully exploit the new integrated knowledge into concrete applications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### SECTION 3: YOUR FIRM'S RELATIONSHIPS WITH OTHER FIRMS

This section includes questions about your firm's knowledge sharing activities and relations with other firms (suppliers, buyers / customers)

14. The following statements relate to your firm's knowledge sharing on managerial and manufacturing processes with other firms *over the last 5 years*. Please indicate the level of your agreement.

1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree

	With Suppliers					With Buyers / Customers				
We share knowledge on market trends and opportunities	1	2	3	4	5	1	2	3	4	5
We share knowledge on managerial techniques	1	2	3	4	5	1	2	3	4	5
We share knowledge on management systems and practices	1	2	3	4	5	1	2	3	4	5
We share knowledge associated with product designs	1	2	3	4	5	1	2	3	4	5
We share knowledge associated with manufacturing and process designs	1	2	3	4	5	1	2	3	4	5
We share knowledge on the technical aspects of products	1	2	3	4	5	1	2	3	4	5

15. The following statements relate to your firm's social relationships with other firms *over the last 5 years*. Please indicate the level of your agreement. 1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree

	Suppliers					Buyers / Customers				
Our middle and senior level managers spend a considerable amount of time on social events with:	1	2	3	4	5	1	2	3	4	5
There are not intensive network between our firm and:	1	2	3	4	5	1	2	3	4	5
Our middle and senior level managers spend a considerable amount of time on business related events (training, seminars etc.) with:	1	2	3	4	5	1	2	3	4	5

**16. The following statements relate to your firm's knowledge sharing on products with other firms over the last 5 years. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	With Suppliers					With Buyers / Customers				
We liaise and share knowledge in the development of new products	1	2	3	4	5	1	2	3	4	5
We share knowledge on extending the product range	1	2	3	4	5	1	2	3	4	5
We share knowledge on entering new technology fields	1	2	3	4	5	1	2	3	4	5
We share knowledge on improving existing product quality	1	2	3	4	5	1	2	3	4	5
We share knowledge on improving production flexibility	1	2	3	4	5	1	2	3	4	5
We share knowledge on reducing production costs	1	2	3	4	5	1	2	3	4	5

**17. The following statements relate to your firm's relationships with other firms. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	Suppliers					Buyers / Customers				
You never have the feeling of being misled in business relationships with:	1	2	3	4	5	1	2	3	4	5
Until they prove that they are trustworthy in business relationships you remain cautious when dealing with:	1	2	3	4	5	1	2	3	4	5
You cover everything with detailed contracts while dealing with:	1	2	3	4	5	1	2	3	4	5
You get a better impression the longer the relationships you have with:	1	2	3	4	5	1	2	3	4	5

**18. The following statements compare your firm's vision with those of other firms. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	Suppliers					Buyers / Customers				
Your firm shares the same vision as your:	1	2	3	4	5	1	2	3	4	5
Your firm does not share similar approaches to business dealings as your:	1	2	3	4	5	1	2	3	4	5
Your firm shares compatible goals and objectives with:	1	2	3	4	5	1	2	3	4	5
Your firm does not share similar corporate culture and management style as your:	1	2	3	4	5	1	2	3	4	5

#### SECTION 4: GENERAL QUESTIONS ABOUT YOUR FIRM

This last section includes some general questions about your firm's ability to store knowledge, institutional support and corporate social responsibility.

**19. The following statements relate to you firm's knowledge storage. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
	1	2	3	4	5
Much of our organisation's knowledge is contained in manuals, databases, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our organisation uses patents and licenses as a way to store knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our organisation embeds much of its knowledge in structures, systems and processes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our organisation's culture (stories, rituals) contains valuable ideas, ways of doing business, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The knowledge that we use is stored mostly in individuals' memory	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**20. The following statements explore the support your firm receives from other firms and institutions. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
	1	2	3	4	5
Your firm has received support for Research and Development (R&D) activities from other firms and/ or institutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You and/ or your employees have received specific business related training by other firms and/ or institutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your firm has received benefits from research activities carried out by other firms and/ or institutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**21. The following statements focus on your firm's corporate social responsibility. Please indicate the level of your agreement.**

**1= Strongly disagree 2= Disagree 3= Neither agree nor disagree 4= Agree 5= Strongly agree**

	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neither agree nor disagree</b>	<b>Agree</b>	<b>Strongly Agree</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
The socially responsible manager must place the interests of the society over the interest of the firm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The fact that corporations have great economic power in our society means that they have a social responsibility beyond the interests of their shareholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
As long as corporations generate acceptable shareholder returns, managers have a social responsibility beyond the interests of shareholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**22. What is your average rate of turnover over the past 5 years for top and middle management (executives, managers, supervisors)?**

☐ Less than 3%   ☐ 3-8%   ☐ 9-14%   ☐ 15-20%   ☐ Over 20%

**23. What is your current job title? .....**

**24. How long have you been at the present company? .....**

**Thank you for taking time to complete this questionnaire.**



## **Appendix 5.1 Principal Component Factor Analysis (Chapter five)**

Social capital variables (social interaction, trust, shared vision) are considered together. Following the theoretical foundations, the number of factors to be extracted is specified as three (Hair et al. 2010). The items related to supplier-buyer distinction are included in the factor analysis. The analysis is repeated for (affiliated) within group/ outside group social capital distinction. Table 5.1 shows the factor loadings of the variable items for within group variables after rotation.

**Table 5.1 Principal Component Factor Analysis for Within BG Social Capital**

<b>Within business group variable items</b>	<b>Factor 1 (Trust)</b>	<b>Factor 2 (SocInt)</b>	<b>Factor 3 (ShrVis)</b>
Our middle and senior level managers spend a considerable amount of time on social events with -supplier		0.50	
Our middle and senior level managers spend a considerable amount of time on business related events (training, seminars etc.) with -supplier		0.41	
Our middle and senior level managers spend a considerable amount of time on social events with -buyer		0.50	
Our middle and senior level managers spend a considerable amount of time on business related events (training, seminars etc.) with -buyer	-0.39		
There is no intensive network between our firm -supplier (R)			0.60
There is no intensive network between our firm and -buyer (R)			0.52
You never have the feeling of being misled in business relationships with -supplier		0.55	
You get a better impression the longer the relationships you have with -supplier	-0.77		
You never have the feeling of being misled in business relationships with -buyer		0.52	
You get a better impression the longer the relationships you have with -buyer	-0.78		
Until they prove that they are trustworthy in business relationships you remain cautious when dealing with -supplier (R)	0.75		
You cover everything with detailed contracts while dealing with -supplier (R)	0.84		
Until they prove that they are trustworthy in business relationships you remain cautious when dealing with -buyer (R)	0.78		
You cover everything with detailed contracts while dealing with -buyer (R)	0.85		
Your firm shares the same vision as your -supplier		0.78	
Your firm shares compatible goals and objectives with -supplier		0.80	
Your firm shares the same vision as your -buyer		0.81	
Your firm shares compatible goals and objectives with -buyer		0.81	
Your firm does not share similar approaches to business dealings as your -supplier (R)			0.79
Your firm does not share similar corporate culture and management style as your -supplier (R)			0.76
Your firm does not share similar approaches to business dealings as your -buyer (R)			0.75
Your firm does not share similar corporate culture and management style as your -buyer (R)			0.75

**R:** Reversed item

The Kaiser-Meyer-Olkin (KMO) measure indicates a value of 0.57 which is just above the acceptable level of 0.5. Individual item KMO values are above 0.5 in most items (Hair et al. 2010) with the exception of reversed items of shared vision variable. The total variance explained by the three-factor solution is 54.05 %, with factor 1 contributing 26.73 %, factor 2 contributing 13.91 % and factor 3 contributing

13.41 %. The items that have significant loading on different factors suggests that factors 1, 2 and 3 represent trust, social interaction and shared vision, respectively. However, crossloadings are observed with these three variables. The Cronbach's alpha values for trust, social interaction and shared vision are 0.34, 0.57 and 0.73, respectively. Factor loadings of social capital variables are problematic:

1. The two reversed items of social interaction variable (one item repeated for supplier-buyer) have loadings over 0.50 but they load on a different factor and one item has a loading of -0.39 on a different factor.

2. The two items of the trust variable (one item repeated for supplier-buyer) load on a different factor and the other two items (one item repeated for supplier-buyer) have high but negative loadings on its own factor which may be problematic.

3. The four items of shared vision variable (two items repeated for supplier-buyer) have factor loadings over 0.70 but they load on different factor.

The analysis is repeated with outside group social capital variable items as problematic item loadings are observed with within group items (Shared vision variable is measured only for within group relations). Table 5.2 shows the factor loadings of the variable items for outside group variables after rotation.

**Table 5.2 Principal Component Factor Analysis for Outside BG Social Capital**

<b>Outside business group variable items</b>	<b>Factor 1 (Trust)</b>	<b>Factor 2 (SocInt)</b>
Our middle and senior level managers spend a considerable amount of time on social events with -supplier		0.72
Our middle and senior level managers spend a considerable amount of time on business related events (training, seminars etc.) with -supplier		0.78
Our middle and senior level managers spend a considerable amount of time on social events with -buyer		0.72
Our middle and senior level managers spend a considerable amount of time on business related events (training, seminars etc.) with -buyer		0.77
There is no intensive network between our firm -supplier (R)		-0.26
There is no intensive network between our firm and -buyer (R)		-0.25
You never have the feeling of being misled in business relationships with -supplier		0.48
You get a better impression the longer the relationships you have with -supplier	-0.84	
You never have the feeling of being misled in business relationships with -buyer		0.54
You get a better impression the longer the relationships you have with -buyer	-0.83	
Until they prove that they are trustworthy in business relationships you remain cautious when dealing with -supplier (R)	0.56	
You cover everything with detailed contracts while dealing with -supplier (R)	0.81	
Until they prove that they are trustworthy in business relationships you remain cautious when dealing with -buyer (R)	0.64	
You cover everything with detailed contracts while dealing with -buyer (R)	0.82	

**R:** Reversed item

The Kaiser-Meyer-Olkin (KMO) measure indicates a value of 0.52 which is just above the acceptable level of 0.5. Individual item KMO values are above 0.5 in most items (Hair et al. 2010). The total variance explained by the two-factor solution is 47.07 %, with factor 1 contributing 26.65 % and factor 2 contributing 20.42 %. The items that have significant loading on different factors suggests that factors 1 and 2 represent trust and social interaction, respectively. The Cronbach's alpha values for trust and social interaction are 0.34 and 0.62, respectively. However, crossloadings are observed with these two variables. The two reversed items of the social interaction variable (one item repeated for supplier-buyer) have very low and negative factor loadings. Similar to the within group analysis, the two items of the trust variable (one item repeated for supplier-buyer) load on a different factor and the other two items (one item repeated for supplier-buyer) have high but negative loadings on its own factor which may be problematic.

Based on these two analyses, it is observed that generally, the reversed and non-reversed items load on different factors than their supposed factors. This might have happened because of the way people interpret and respond to items. These differing factors may be artifacts which may not be different factors. (Spector et al. 1997). However, the two repeated items of social interaction variable, the four repeated items of trust variable and the four repeated items of shared vision variable are deleted as a result of principal component factor analysis.

## **Appendix 5.2 Confirmatory Factor Analysis (Chapter five)**

Social interaction, trust and shared vision variables are considered together. The dependent variable knowledge sharing is analysed separately. The analysis is repeated for (affiliated) within group and outside group social capital and knowledge sharing variables distinction.

**Factor Loadings:** Table 5.3 shows the standardised factor loadings, z statistics of all items related to knowledge sharing, social interaction, trust and shared vision variables. The analysis is repeated for within group and outside group distinction to examine the similarities and differences between the factor loadings, AVEs and composite reliabilities. All the factor loadings are significant ( $p < 0.001$ ).

**Table 5.3 Confirmatory Factor Analysis for Knowledge Sharing and Social Capital**

Items	Within group Standardised loadings	z statistic	Outside group Standardised loadings	z statistic
<b>Knowledge sharing</b>	<b>AVE= 0.54</b>		<b>AVE= 0.59</b>	
	<b>CR= 0.87</b>		<b>CR= 0.89</b>	
We share knowledge on market trends and opportunities -supplier	0.52	6.96	0.61	9.33
We share knowledge on managerial techniques -supplier	0.82	21.59	0.82	21.71
We share knowledge on management systems and practices -supplier	0.73	14.47	0.75	15.98
We share knowledge on market trends and opportunities -buyer	0.44	5.56	0.54	7.59
We share knowledge on managerial techniques -buyer	0.91	36.35	0.88	31.73
We share knowledge on management systems and practices -buyer	0.88	32.22	0.92	40.32
<b>Chi-square</b>	$\chi^2(9)=$ 124.85	p<0.001	$\chi^2(9)=$ 121.36	p<0.001
<b>RMSEA</b>	0.33		0.33	
<b>CFI</b>	0.75		0.77	
<b>SRMR</b>	0.10		0.09	
<b>CD</b>	0.9		0.9	
	<b>AVE= 0.59</b>		<b>AVE= 0.52</b>	
	<b>CR= 0.81</b>		<b>CR= 0.81</b>	
<b>Social interaction</b>				
Our middle and senior level managers spend a considerable amount of time on social events with -supplier	0.90	16.00	0.58	7.40
Our middle and senior level managers spend a considerable amount of time on business related events (training, seminars etc.) with -supplier	0.52	6.71	0.85	17.82
Our middle and senior level managers spend a considerable amount of time on social events with -buyer	0.83	14.51	0.62	8.02
Our middle and senior level managers spend a considerable amount of time on business related events (training, seminars etc.) with -buyer	(within group deleted item)	-	0.80	16.60
	<b>AVE= 0.60</b>		<b>AVE= 0.48</b>	
	<b>CR= 0.85</b>		<b>CR= 0.77</b>	
<b>Trust</b>				
Until they prove that they are trustworthy in business relationships you remain cautious when dealing with -supplier	0.92	39.54	0.82	18.66
You cover everything with detailed contracts while dealing with -supplier	0.56	8.04	0.42	5.00
Until they prove that they are trustworthy in business relationships you remain cautious when dealing with -buyer	0.95	43.33	0.93	21.37
You cover everything with detailed contracts while dealing with -buyer	0.57	8.24	0.46	5.44
<b>Shared vision (Within group)</b>				
<b>AVE= 0.68 CR= 0.89</b>				

Your firm shares the same vision as your -supplier	0.91	37.82	-	-
Your firm shares compatible goals and objectives with -supplier	0.72	13.53	-	-
Your firm shares the same vision as your -buyer	0.93	40.54	-	-
Your firm shares compatible goals and objectives with -buyer	0.72	13.47	-	-
	$\chi^2 (41)=$		$\chi^2 (19)=$	
<b>Chi-square</b>	322.18	p<0.001	175.87	p<0.001
<b>RMSEA</b>	0.24		0.27	
<b>CFI</b>	0.69		0.65	
<b>SRMR</b>	0.10		0.12	
<b>CD</b>	1		0.9	

**AVE:** Average variance extracted **CR:** Composite reliability **RMSEA:** Root mean square error of approximation **CFI:** Comparative fit index **SRMR:** Standardised root mean residual

**CD:** Coefficient of determination

**Overall fit:** The root mean square of approximation (RMSEA) is higher than the acceptable level of 0.08 in both models with within group and outside group distinction (Schumacker and Lomax 2010; Acock 2013). The comparative fit index (CFI) values are between 0.65 and 0.77 which are slightly below the acceptable level of 0.90 (Hair et al. 2010). The standardised root mean residual (SRMR) values are between 0.09 and 0.12 which are slightly above the cut off value of 0.08 for both models (Schumacker and Lomax 2010; Hair et al. 2010; Acock 2013). The CD is equal or close to 1 in all models. According to these model fit indices, the model fit is reasonable, although not acceptable (Schumacker and Lomax 2010).

**Convergent Validity:** Except for one item for knowledge sharing and two items for trust, factor loadings are above 0.5 and significant ( $p<0.001$ ). The average variances extracted for within and outside group knowledge sharing are 0.54 and 0.59, respectively. The composite reliabilities are 0.87 and 0.89 for the within and outside group knowledge sharing variable, with an overall composite reliability of 0.90. The average variances extracted for social interaction, trust and shared vision are 0.59, 0.60 and 0.68, respectively. The same value for outside group social interaction and trust are 0.52 and 0.88, respectively. The composite reliabilities for the same variables are 0.81, 0.85 and 0.89 (0.81 and 0.77 for outside group social interaction and trust items), respectively. The AVE values are generally above the acceptable level of 0.5 and the composite reliabilities are above the acceptable level of 0.6-0.7 (Hair et al. 2010; Bagozzi and Yi 1988). These results show that the convergent validity is achieved in

these models. Also, when the dependent variable knowledge sharing is examined with within and outside group items together, the AVE value is 0.45 and the composite reliability is 0.90; with the fit indices RMSEA= 0.35, CFI= 0.45, SRMR= 0.15 and CD= 0.93.

**Discriminant Validity:** Table 5.4 shows the average variance extracted (AVE) and the squared correlations between variables. All the AVE values are larger than the squared correlation values between variables. (The variables are allowed to correlate in models.) The analysis of the model with outside group variable items show a similar result. Therefore, discriminant validity is achieved between social capital and knowledge sharing variables.

**Table 5.4 Discriminant Validity for Knowledge Sharing and Social Capital**

	<b>Knowledge sharing</b>	<b>Social interaction</b>	<b>Trust</b>	<b>Shared vision</b>
<b>Knowledge sharing</b>	<b>0.45</b>			
<b>Social interaction</b>	0.12	<b>0.59</b>		
<b>Trust</b>	0.00	0.00	<b>0.60</b>	
<b>Shared vision</b>	0.15	0.12	0.00	<b>0.68</b>

The AVE values on diagonal, the squared correlations off diagonal

**Reliability Analysis:** The reliability of the variables is also assessed with composite reliability values. Table 5.5 presents the results. First, the overall reliabilities for knowledge sharing and each social capital variable are calculated. Then, because the items for knowledge sharing and social capital (except for shared vision) are repeated for within group and outside group relations in the questionnaire of group firms, the Cronbach's alpha ( $\alpha$ ) coefficients and composite reliabilities of knowledge sharing, social interaction and trust variables are calculated for within group and outside group items (considering all supplier-buyer items together) for each variable. In general, all variables have reliabilities over a general acceptable value of 0.70 (Hair et al. 2010).



**Table 5.5 Composite Reliability for Knowledge Sharing and Social Capital**

<b>Variables</b>	<b>Composite reliability</b>	<b>Cronbach's alpha</b>
<b>Knowledge sharing</b>	<b>0.90</b>	<b>0.91</b>
Within group	0.87	0.88
Outside group	0.89	0.89
<b>Social interaction</b>	<b>0.87</b>	<b>0.88</b>
Within group	0.81	0.79
Outside group	0.81	0.80
<b>Trust</b>	<b>0.81</b>	<b>0.86</b>
Within group	0.85	0.87
Outside group	0.77	0.79
<b>Shared vision</b>	<b>0.89</b>	<b>0.90</b>

### **Appendix 5.3 Common Method Variance (Chapter five)**

#### **Harman's One Factor Test**

The principal component factor analysis (unrotated) is carried out on two models including dependent variables in each model: a) knowledge sharing and within group social interaction, trust and shared vision variables; b) knowledge sharing, outside group social interaction, trust and shared vision variables. In the first and second models, five and four factors emerged, with the first factors accounting for 31.01% and 34.66% of the total variance in each model, respectively. One general factor does not emerge in none of the models, therefore, according to the Harman's one factor test with PCF, it is unlikely that the data is biased due to common method variance. A further examination is conducted with confirmatory factor analysis.

Harman's one factor test is repeated with confirmatory factor analysis with the models given above: a) knowledge sharing, within group social capital variables b) knowledge sharing, outside group social capital variables. Each model, which includes items loading on single factor (one factor), is compared with the model (original model) that have items loading on relevant variables. The fit indices related to original and one factor models are given in Table 5.6. When the original and one factor models are compared, the one factor models show poorer fit with the data, therefore according to the Harman's one factor test it is unlikely that the data is biased due to common method variance.

**Table 5.6 Harman's Test with CFA for Knowledge Sharing and Social Capital**

Model	Original					One factor				
	$\chi^2$	DF	RMSEA	CFI	SRMR	$\chi^2$	DF	RMSEA	CFI	SRMR
<b>a</b>	527.66	113	0.184	0.704	0.102	1104.93	119	0.277	0.297	0.190
<b>b</b>	377.72	74	0.195	0.686	0.107	618.46	77	0.255	0.440	0.168

The common method variance cannot be assessed with confirmatory factor analysis marker variable because Method C and Method U models do not converge (see chapters three and six). However, according to the Harman's one factor test with principal component factor and confirmatory factor analyses, it is unlikely that the data is biased due to common method variance.

#### **Appendix 5.4 Nonresponse Bias (Chapter five)**

Table 5.7 shows the results of the t test.

**Table 5.7 Nonresponse Bias Test for Knowledge Sharing and Social Capital**

	Early respondents (n=56)		Late respondents (n=72)		N=128	
Variable	Mean	SD	Mean	SD	T test	Pr (.05)
Knowledge Sharing	3.34	0.78	3.41	0.72	t(126)= 0.5469	0.5854
Social interaction	3.30	0.80	3.50	0.79	t(125)= 1.4333	0.1543
Trust	1.97	0.76	1.91	0.60	t(126)= -0.4359	0.6636
Shared vision	3.61	0.87	3.46	0.93	t(122)= -0.8908	0.3748

#### **Appendix 5.5 Endogeneity (Chapter five)**

It is possible that firms which engage in more knowledge sharing activities develop more social capital because of the business relations among themselves. Therefore, to address potential endogeneity related to social interaction, trust, shared vision variables, a two stage least squares (2SLS) instrumental variable regression analysis is conducted (Stock and Watson 2015). Institutional support, organisational capital, university graduates and turnover are used as instrumental variables. In the

first stage, regression models have social interaction, trust and shared vision as dependent variables. In the second stage, knowledge sharing is considered as dependent variable; social interaction, trust, shared vision and affiliation and the interaction terms between social capital variables and affiliation are the independent variables; firm size, firm age, industry and R&D are the control variables. The validity and relevance of the instrumental variables are examined with several tests which are explained below. The endogeneity of the social capital variables are assessed with the Durbin and Wu-Hausman statistics.

**Tests of overidentifying restrictions:** In the model, the results show a Sargan test with p value of 0.84 ( $p > 0.05$ ;  $\chi^2(1) = 0.042746$ ) and a Basman test with p value of 0.85 ( $p > 0.05$ ;  $\chi^2(1) = 0.038051$ ). Since the tests are not significant, it can be inferred that the instruments are valid and the model is specified correctly, however, in order to further check whether the instruments are valid, the relevance of the instruments are tested in the next part.

**Relevance of the instruments:** The F statistics from the first stage regressions of social interaction, trust and shared vision are 1.60 ( $p = 0.18$ ), 1.95 ( $p = 0.11$ ) and 3.33 ( $p = 0.01$ ), respectively; indicating that the instruments may be weak in the models because the F statistics are less than 10 and only for the shared vision variable the test is significant ( $p < 0.05$ ). However, Cameron and Trivedi (2010, p.196) argue that “*there is no clear critical value for the F statistic because it depends on the criteria used, the number of endogenous variables and the number of overidentifying restrictions (excess instruments)*”.

**Tests of endogeneity:** In the model, the results show a Durbin test with p value of 0.06 ( $p > 0.05$ ;  $\chi^2(3) = 7.53998$ ) and a Wu-Hausman test with p value of 0.08 ( $p > 0.05$ ;  $F(3, 103) = 2.34359$ ). Since the tests are not significant (at 95%), social interaction, trust and shared vision variables are exogenous. Therefore, it is appropriate to interpret OLS results.

## Appendix 5.6 Heteroscedasticity (Chapter five)

The Breusch-Pagan test results are:  $p = 0.02$  ( $p < 0.05$ ) for the full model with all variables and interactions;  $p = 0.01$  ( $p < 0.05$ ) for the independent variables and interaction terms. Since the full model shows heteroscedasticity problem (at 95% level) with the Breusch-Pagan results, the test is repeated to further detect the independent variable or interaction terms that may cause the heteroscedasticity problem. The results show that from the control variables firm size ( $p = 0.03$ ), firm age ( $p = 0.04$ ) and from the independent variables, affiliation ( $p = 0.03$ ) are significant. As a result, heteroscedasticity may be a function of the control variables or the affiliation variable. White's test results has a p value of 0.23 ( $\chi^2(2) = 65.37$ ), ( $p > 0.05$ ) which shows no evidence of heteroscedasticity.

A White-corrected standard errors are calculated in order to obtain heteroscedasticity-robust standard errors (Cameron and Trivedi 2010). The results depict that only the interaction variable between shared vision and affiliation becomes insignificant in model 7 with the heteroscedasticity-robust t statistic, however, it is still positive and significant in the full model ( $b = 0.299$ ,  $p < 0.1$ ). A comparison of coefficients, standard errors (nonrobust-robust) and t statistics are presented in Table 5.10.

**Table 5.10 Estimates with OLS Nonrobust and Robust Standard Errors for SC**

Variable	Nonrobust			Robust		
	b	se	t	b	se	t
Social int.	0.3893	0.099	3.92	0.3893	0.141	2.76
Trust	-0.2748	0.114	-2.41	-0.2748	0.122	-2.25
Shared vis.	-0.0374	0.108	-0.35	-0.0374	0.142	-0.26
Affiliation	-0.0243	0.123	-0.20	-0.0243	0.129	-0.19
Social int. X Affiliation	-0.2973	0.181	-1.64	-0.2973	0.182	-1.63
Trust X Affiliation	0.3822	0.194	1.97	0.3822	0.188	2.03
Shared vis. X Affiliation	0.2991	0.143	2.09	0.2991	0.163	1.83

**b:** Coefficient estimate **se:** Standard error **t:** T statistic

## Appendix 6.1 Principal Component Factor Analysis (Chapter six)

Innovation and knowledge sharing (explorative, exploitative) variables are considered together. Following the theoretical foundations, the number of factors to be extracted is specified as three (Hair et al. 2010). Considering the sample size (N=128), the factor loadings of 0.5 and above are stated (Hair et al. 2010). However, a value of 0.4 is reported in the case of cross loadings as a factor loading between 0.3 and 0.4 can also be considered acceptable for interpretation of structure (Hair et al. 2010). The items related to supplier-buyer distinction are included in the factor analysis. The analysis is repeated for (affiliated) within group/ outside group knowledge sharing distinction. Table 6.1 shows the factor loadings of the variable items for innovation and outside group variables after rotation.

**Table 6.1 Principal Component Factor Analysis for Outside BG Knowledge Sharing**

<b>Outside business group variable items</b>	<b>Factor 1 (Explorat)</b>	<b>Factor 2 (Exploitat)</b>	<b>Factor 3 (Innov)</b>
Introduction of new product lines			0.73
Changes/ improvements to existing product lines			0.76
Introduction of new equipment/ technology in the production process			0.75
Introduction of new input materials in the production process			0.80
Introduction of organisational changes/ improvements made in the production process			0.82
Share knowledge in the development of new products -supplier	0.89		
Share knowledge on extending the product range -supplier	0.73		
Share knowledge on entering new technology fields -supplier	0.68		
Share knowledge in the development of new products -buyer	0.70		
Share knowledge on extending the product range -buyer	0.42	0.60	
Share knowledge on entering new technology fields -buyer		0.82	
Share knowledge on improving existing product quality -supplier	0.75		
Share knowledge on improving production flexibility -supplier	0.59	0.58	
Share knowledge on reducing production costs -supplier	0.66		
Share knowledge on improving existing product quality -buyer	0.46	0.67	
Share knowledge on improving production flexibility -buyer		0.82	
Share knowledge on reducing production costs -buyer		0.72	

The Kaiser-Meyer-Olkin (KMO) measure indicates a value of 0.82 which is above the acceptable level of 0.5. Individual item KMO values are also above 0.5 (Hair et al. 2010). The total variance explained by the three-factor solution is 65.90 %, with factor 1 contributing 43.57 %, factor 2 contributing 15.55 % and factor 3 contributing 6.78 %. The items that have significant loading on different factors suggests that factors 1, 2 and 3 represent explorative knowledge sharing, exploitative knowledge sharing and innovation, respectively. However, there are cross loadings on explorative and exploitative knowledge sharing which may cause a discriminant validity problem. Also, while the outside group knowledge sharing items show the pattern above, within group items for the two knowledge sharing variables load on one factor. This issue is discussed in confirmatory factor and discriminant analyses parts as it may effect the discriminant validity between the two constructs.

## **Appendix 6.2 Confirmatory Factor Analysis (Chapter six)**

Considering the sample size, the confirmatory factor analysis (CFA) is conducted grouping theoretically related items and variables (Hair et al. 2010; Atuahene-Gima 2005; Li and Atuahene-Gima 2001; Rosetti and Choi 2008). The model is analysed using maximum likelihood estimation technique with a standardised solution. Innovation, explorative and exploitative knowledge sharing variables are considered together. The analysis is repeated for (affiliated) within group- outside group knowledge sharing distinction.

**Factor Loadings:** Table 6.2 shows the standardised factor loadings, z statistics of all items related to innovation, explorative and exploitative knowledge sharing variables. The analysis is repeated for knowledge sharing variables for within group and outside group distinction to examine the similarities and differences between the factor loadings, AVEs and composite reliabilities. All the factor loadings are significant ( $p < 0.001$ ).

**Table 6.2 Confirmatory Factor Analysis for Innovation and Knowledge Sharing**

Items	Within group Standardised loadings	z statistic	Outside group Standardised loadings	z statistic
<b>Innovation</b>				
<b>AVE= 0.53 CR= 0.85</b>				
Introduction of new product lines	0.60	8.21	0.59	8.46
Changes/ improvements to existing product lines	0.71	12.34	0.70	12.36
Introduction of new equipment/ technology in the production process	0.70	12.15	0.72	13.03
Introduction of new input materials in the production process	0.75	14.47	0.75	15.00
Introduction of organisational changes/ improvements made in the production process	0.86	21.93	0.86	22.81
<b>Explorative knowledge sharing</b>	<b>AVE= 0.63 CR= 0.91</b>		<b>AVE= 0.54 CR= 0.87</b>	
Share knowledge in the development of new products - supplier	0.76	17.28	0.76	16.08
Share knowledge on extending the product range-supplier	0.85	27.54	0.81	21.11
Share knowledge on entering new technology fields -supplier	0.76	16.83	0.76	16.95
Share knowledge in the development of new products - buyer	0.82	22.73	0.71	13.13
Share knowledge on extending the product range -buyer	0.82	23.22	0.65	10.68
Share knowledge on entering new technology fields -buyer	0.73	14.86	0.69	11.96
<b>Exploitative knowledge sharing</b>	<b>AVE= 0.62 CR= 0.91</b>		<b>AVE= 0.56 CR= 0.88</b>	
Share knowledge on improving existing product quality -supplier	0.87	32.19	0.77	17.60
Share knowledge on improving production flexibility -supplier	0.84	25.75	0.87	28.46
Share knowledge on reducing production costs-supplier	0.73	15.25	0.69	12.69
Share knowledge on improving existing product quality -buyer	0.78	18.66	0.74	15.30
Share knowledge on improving production flexibility -buyer	0.80	20.55	0.75	15.96
Share knowledge on reducing production costs -buyer	0.67	11.63	0.64	10.60
<b>Chi-square</b>	$\chi^2$ (116)= 383.10	p<0.001	$\chi^2$ (116)= 399.13	p<0.001
<b>RMSEA</b>	0.15		0.15	
<b>CFI</b>	0.81		0.77	
<b>SRMR</b>	0.07		0.07	
<b>CD</b>	1		1	

**AVE:** Average variance extracted **CR:** Composite reliability **RMSEA:** Root mean square error of approximation **CFI:** Comparative fit index **SRMR:** Standardised root mean residual **CD:** Coefficient of determination

**Overall fit:** The overall fit of the measurement models is assessed with RMSEA, CFI, SRMR and CD. The root mean square of approximation (RMSEA) is equal to 0.15 and higher than the acceptable level of 0.08 in both models with within group and outside group distinction (Schumacker and Lomax 2010; Acock 2013). Hu and Bentler (1999, p.11) state that in small sample sizes ( $N < 250$ ) the RMSEA “*overrejects the true model and is less preferable*”. The comparative fit index (CFI) is 0.81 and 0.77 which is slightly below the acceptable level of 0.90 (Hair et al. 2010). The standardised root mean residual (SRMR) is 0.07 which is below the cut off value of 0.08 for both models (Schumacker and Lomax 2010; Hair et al. 2010; Acock 2013). A coefficient of determination (CD) value close to 1 indicates a good fit (Stata SEM Reference Manual, Release 14). The CD is 1 for both models. The normed chi-square (the chi-square value divided by the degrees of freedom) ranges between 3.30 and 3.44 which is within the acceptable range of 2.0-5.0 (Hair et al. 2010). According to these model fit indices, the model fit is reasonable, although not acceptable (Schumacker and Lomax 2010).

**Convergent Validity:** In order to assess convergent validity, factor loadings, average variance extracted and composite reliabilities are examined. The standardised factor loadings should be at least 0.5 or 0.7 (Hair et al. 2010). The AVE value should be over 0.5; “*if it is less than 0.50, the variance due to measurement error is larger than the variance captured by the construct*” (Fornell and Larcker 1981, p.46). The composite reliability “*value greater than about 0.6 is desirable*” (Bagozzi and Yi 1988, p.80). All the factor loadings are above 0.5 and significant ( $p < 0.001$ ). For innovation, the average variance extracted (AVE) is 0.53 and the composite reliability is 0.85. The average variances extracted for explorative and exploitative knowledge sharing are 0.63 and 0.54, respectively (0.62 and 0.56 for outside group variable items). The composite reliabilities for the same variables are 0.91 and 0.87 (0.91 and 0.88 outside group variable items), respectively. The AVE values are above the acceptable level of 0.5 and the composite reliabilities are above the acceptable level of 0.6-0.7 (Hair et al. 2010; Bagozzi and Yi 1988). These results show that the convergent validity is achieved in these models. Also, when the dependent variable innovation is examined separately, the AVE value is 0.56 and the composite reliability is 0.86; with the acceptable fit indices RMSEA= 0.12, CFI= 0.97, SRMR= 0.03 and CD= 0.89.



**Discriminant Validity:** In order to achieve the discriminant validity the average variance extracted of the two variables should be larger than the squared correlation between the two variables (Fornell and Larcker 1981). Table 6.3 shows the average variance extracted (AVE) and the squared correlations between variables. In the model with innovation and within group knowledge sharing variable items, the AVE value of innovation is larger than the squared correlation values between innovation and the two knowledge sharing variables. However, the AVE values of within explorative and exploitative knowledge sharing variables are smaller than the correlation between the two variables. (The variables are allowed to correlate in both models.) Therefore, discriminant validity is achieved between innovation and knowledge sharing variables, but it is not achieved between within explorative and exploitative knowledge sharing variables. The analysis of the model with innovation and outside knowledge sharing items shows a similar result. The AVE values are higher than the correlation between (outside) explorative and exploitative knowledge sharing variable.

For both knowledge sharing variables, composite reliabilities are higher than 0.8. These two variables are well defined and reliable. Also, in order to reduce multicollinearity, removing one of these variables may bias the results because they both represent overall knowledge sharing strategies from the perspective of familiarity of knowledge. Therefore, in the regression analysis these two variables are used in separate models.

**Table 6.3 Discriminant Validity for Innovation and Knowledge Sharing**

	<b>Innovation</b>	<b>Explorative KS</b>	<b>Exploitative KS</b>
<b>Innovation</b>	<b>0.53</b>		
<b>Explorative KS</b>	0.06	<b>0.63</b>	
<b>Exploitative KS</b>	0.07	0.89	<b>0.62</b>

The AVE values on diagonal, the squared correlations off diagonal

**Reliability Analysis:** In addition to the Cronbach's alpha values, the reliability of the variables is assessed with composite reliability values. Table 6.4 shows the results. First, the overall reliabilities for each knowledge sharing variable is calculated. Then, because the items for knowledge sharing are repeated for within group and outside group relations in the questionnaire of group firms, the Cronbach's alpha ( $\alpha$ )

coefficients and composite reliabilities of explorative and exploitative knowledge sharing variables are calculated for within group and outside group items (considering all supplier-buyer items together) for each variable. For instance, within group explorative knowledge sharing is measured with three items, however, the reliability analysis is calculated with six items considering the scores for suppliers and buyers together for within explorative knowledge sharing variable. In general, knowledge sharing variables have reliabilities over a general acceptable value of 0.70 (Hair et al. 2010). The marker variable corporate social responsibility has a Cronbach alpha value of 0.60.

**Table 6.4 Composite Reliability for Innovation and Knowledge Sharing**

<b>Variables</b>	<b>Composite reliability</b>	<b>Cronbach's alpha</b>
<b>Innovation</b>	<b>0.85</b>	<b>0.86</b>
<b>Explorative KS</b>	<b>0.91</b>	<b>0.91</b>
Within group	0.91	0.90
Outside group	0.87	0.87
<b>Exploitative KS</b>	<b>0.91</b>	<b>0.91</b>
Within group	0.91	0.90
Outside group	0.88	0.87
<b>CSR (marker variable)</b>	<b>0.63</b>	<b>0.60</b>

## **Appendix 6.3 Common Method Variance (Chapter six)**

### **1. Harman's One Factor Test**

The principal component factor analysis (unrotated) is carried out on two models including dependent variable in each model: a) innovation, within group explorative and exploitative knowledge sharing variables b) innovation, outside group explorative and exploitative knowledge sharing variables. In the first and second models, two and three factors emerged, with the first factors accounting for 46.63% and 43.57% of the total variance in each model, respectively. One general factor does not emerge in none of the models, however, since the total variances explained are high, a further examination is conducted with confirmatory factor analysis.

Harman's one factor test is repeated with confirmatory factor analysis with the models given above: a) innovation, within group knowledge sharing variables; b) innovation, outside group knowledge sharing variables. Each model, which includes items loading on single factor (one factor), is compared with the model (original model) that have items loading on relevant variables. The fit indices related to original and one factor models are given in Table 6.5. When the original and one factor models are compared, the one factor models show poorer fit with the data, therefore according to the Harman's one factor test it is unlikely that the data is biased due to common method variance.

**Table 6.5 Harman's Test with CFA for Innovation and Knowledge Sharing**

Model	Original					One factor				
	$\chi^2$	DF	RMSEA	CFI	SRMR	$\chi^2$	DF	RMSEA	CFI	SRMR
<b>a</b>	383.10	116	0.146	0.806	0.065	590.21	119	0.191	0.658	0.132
<b>b</b>	399.13	116	0.148	0.769	0.074	594.56	119	0.190	0.613	0.128

## 2. Confirmatory Factor Analysis with Marker Variable

In addition to the Harman's one factor test, the confirmatory factor analysis marker variable technique with structural equation modelling is conducted to further examine the common method variance problem following Richardson et al. (2009), Williams et al. (2010), Williams and O'Boyle (2015) and Podsakoff et al. (2012). CMV is assessed with two models including the marker variable in each model: a) Innovation, within group explorative and exploitative knowledge sharing and CSR; b) Innovation outside group explorative and exploitative knowledge sharing and CSR. Table 6.6 and Table 6.7 show the results, respectively.

**Table 6.6 CFA Marker Variable for Innovation Within BG Knowledge Sharing**

Model	$\chi^2$	DF	CFI
1.CFA	458.41	164	0.79
2.Baseline	459.90	172	0.80
3.Method-C	459.34	171	0.80
4.Method-U	409.01	155	0.82
5.Method-R	412.08	158	0.82
<b>Chi-square model comparison tests</b>			
$\Delta$ Models	$\Delta\chi^2$	$\Delta$ df	Chi-square critical Value; 0.05
<b>1.Baseline vs. Method-C</b>	0.56	1	
<b>2.Method-C vs. Method-U</b>	50.33	16	
<b>3.Method-U vs. Method-R</b>	3.07	3	

1. The chi-square difference test comparing the Baseline model and Method-C model is not significant ( $p= 0.45$ ;  $p>0.05$ ). Therefore, the Baseline model fits better than the Method-C model. There is no evidence of CMV in the data according to this comparison.

2. The chi-square difference test comparing the Method-C model and Method-U model is significant ( $p= 0.00$ ;  $p<0.0001$ ). Therefore, the Method-U model fits better than the Method-C model. There is evidence of unequal (congeneric) method effects. (The marker variable loadings are not equal.)

3. For the Method-C or Method-U and Method-R comparison Method-U model is retained. The chi-square difference test comparing the Method-U model and Method-R model is not significant ( $p= 0.38$ ;  $p>0.05$ ). The Method-R model fits better than the Method-U model. (Method-U model fits worse than Method-R model). Therefore, there is no evidence of bias because of CMV. The comparison of the Method-U model and Method-R model shows that the effect of the marker variable does not significantly bias factor correlation estimates.

**Table 6.7 CFA Marker Variable for Innovation Outside BG Knowledge Sharing**

Model	$\chi^2$	DF	CFI
1.CFA	460.81	164	0.77
2.Baseline	462.54	172	0.78
3.Method-C	462.53	171	0.77
4.Method-U	422.87	155	0.79
5.Method-R	430.93	158	0.78
<b>Chi-square model comparison tests</b>			
<b><math>\Delta</math>Models</b>	$\Delta\chi^2$	$\Delta df$	Chi-square critical Value; 0.05
<b>1.Baseline vs. Method-C</b>	0.01	1	
<b>2.Method-C vs. Method-U</b>	39.66	16	
<b>3.Method-U vs. Method-R</b>	8.06	3	

1. The chi-square difference test comparing the Baseline model and Method-C model is not significant ( $p= 0.92$ ;  $p>0.05$ ). Therefore, the Baseline model fits better than the Method-C model. There is no evidence of CMV in the data according to this comparison.

2. The chi-square difference test comparing the Method-C model and Method-U model is significant ( $p= 0.00$ ;  $p<0.001$ ). Therefore, the Method-U model fits better than the Method-C model. There is evidence of unequal (congeneric) method effects. (The marker variable loadings are not equal.)

3. For the Method-C or Method-U and Method-R comparison Method-U model is retained. The chi-square difference test comparing the Method-U model and Method-R model is significant ( $p=0.04$ ;  $p<0.05$ ). The Method-U model fits better than the Method-R model. (Method-R model fits worse than Method-U model). Therefore, there is evidence of bias because of CMV. Whilst previous tests do not show significant effects of the marker variable, the Method-U model and Method-R model comparison shows that the effect of the marker variable significantly bias factor correlation estimates.

According to the marker variable technique results, in models the CMV and bias are not observed simultaneously. When the two models are examined, the bias exists in one model with innovation and outside group knowledge sharing variable combinations. Richardson et al. (2009) suggest that CFA technique is useful when an ideal marker is defined and used to detect CMV. In this case, the marker variable CSR is expected to be unrelated to the other variables in this study. Therefore, whilst some bias is observed in one model, it may be related to the theoretical effects of the marker variable. Also, CFA marker technique is recommended not as a definitive method, but as a means of providing some evidence about its presence or absence (Richardson et al. 2009).

#### Appendix 6.4 Nonresponse Bias (Chapter six)

Table 6.8 shows the results of the t test.

**Table 6.8 Nonresponse Bias Test for Innovation, Knowledge Sharing and Controls**

Variable	Early respondents (n=56)		Late respondents (n=72)		N=128	
	Mean	SD	Mean	SD	T test	Pr (.05)
Firm age	32.45	15.93	34.21	17.03	t(126)=0.5972	0.5514
Firm size	5.98	1.51	5.96	1.84	t(126)= -0.0784	0.9376
R&D	1.47	0.74	1.68	1.01	t(122)= 1.2820	0.2023
Innovation	3.21	0.83	3.36	0.76	t(125)= 1.0605	0.2910
Explorative KS	3.48	0.78	3.48	0.78	t(126)= -0.0656	0.9478
Exploitative KS	3.49	0.78	3.57	0.85	t(126)= 0.5433	0.5879

## Appendix 6.5 Endogeneity (Chapter six)

It is probable that more innovative firms have more knowledge sharing or transfers among themselves because they may have more incentives or resources to engage in relevant activities. Therefore, to address potential endogeneity related to explorative and exploitative knowledge sharing variables, a two stage least squares (2SLS) instrumental variable regression analysis is conducted (Stock and Watson 2015). Institutional support, organisational capital, university graduates and turnover are used as instrumental variables. The potential multicollinearity can be a problem with 2SLS (Stock and Watson 2015; Wooldridge 2014), therefore, because of the high correlation between explorative and exploitative knowledge sharing, two variables are entered in different regressions. In the first stage, regression models have explorative and exploitative knowledge sharing as dependent variables. In the second stage, innovation is considered as dependent variable; explorative, exploitative knowledge sharing and affiliation and the interaction terms between knowledge sharing variables and affiliation are the independent variables; firm size, firm age, industry and R&D are the control variables. The validity and relevance of the instrumental variables are examined with several tests which are explained below. The endogeneity of the knowledge sharing variables are assessed with the Durbin and Wu-Hausman statistics.

**Tests of overidentifying restrictions:** Tests of overidentifying restrictions examine whether the instruments are uncorrelated with the error term and whether the equation is misspecified and that one or more of the excluded exogenous variables should in fact be included in the structural equation (Stata Base Reference Manual, Release 14). If the model is overidentified (the number of instruments exceeds the number of endogenous variables), whether the instruments are uncorrelated with the error term can be tested. Sargan's and Basmann's chi-square tests are reported with 2SLS estimator. If the test is significant, either the instrument is invalid or the structural equation is incorrectly specified. In the model with explorative knowledge sharing, the results show a Sargan test with p value of 0.77 ( $p > 0.05$ ;  $\chi^2(3) = 1.13336$ ) and a Basmann test with p value of 0.79 ( $p > 0.05$ ;  $\chi^2(3) = 1.04007$ ). In the model with exploitative knowledge sharing, the results show a Sargan test with p value of 0.62 ( $p > 0.05$ ;  $\chi^2(3) = 1.77928$ ) and a Basmann test with p value of 0.65 ( $p > 0.05$ ;  $\chi^2(3) = 1.64166$ ). Since the tests are not significant, it can be inferred that the

instruments are valid and the model is specified correctly, however, in order to further check whether the instruments are valid, the relevance of the instruments are tested in the next part.

**Relevance of the instruments:** If the instrumental variables explain little of the variation in endogenous variables, they are weak (Stock and Watson 2015). If the instruments are weak 2SLS estimator may be biased (Stock and Watson 2015), standard errors may be larger, t statistic may be smaller (Cameron and Trivedi 2010). In order to determine whether the instruments are weak, several statistics are performed. These statistics measure the relevance of the excluded exogenous variables to understand the explanatory power of the instruments. The way of checking whether the instrumental variables are weak is achieved by obtaining the F statistic for joint significance of the instruments in the first stage regression of the endogenous variable on instrumental and exogenous variables (Cameron and Trivedi 2010). If the F statistic is not significant, the instrumental variables are weak but this significance is not sufficient; if the F statistic exceeds 10, it can be inferred that the instruments are not weak (Stock and Watson 2015; Stata Base Reference Manual, Release 14). In this case, the F statistics from the first stage regressions of explorative and exploitative knowledge sharing are 3.22 ( $p=0.02$ ) and 2.68 ( $p=0.04$ ); indicating that the instruments may be weak in the models because the F statistics are less than 10, whilst the test significance ( $p<0.05$ ) shows strong instruments. However, Cameron and Trivedi (2010, p.196) argue that “*there is no clear critical value for the F statistic because it depends on the criteria used, the number of endogenous variables and the number of overidentifying restrictions (excess instruments)*”.

**Tests of endogeneity:** Endogeneity tests determine whether a variable presumed to be endogenous are in fact exogenous. The Durbin and Wu-Hausman statistics are reported with 2SLS estimator. If the test is significant, the variables are endogenous. In the model with explorative knowledge sharing, the results show a Durbin test with p value of 0.43 ( $p>0.05$ ;  $\chi^2(2) = 0.63369$ ) and a Wu-Hausman test with p value of 0.44 ( $p>0.05$ ;  $F(1, 112) = 0.589644$ ). In the model with exploitative knowledge sharing, the results show a Durbin test with p value of 0.28 ( $p>0.05$ ;  $\chi^2(1) = 1.15062$ ) and a Wu-Hausman test with p value of 0.30 ( $p>0.05$ ;  $F(1, 112) =$

1.07526). Since the tests are not significant, explorative and exploitative knowledge sharing variables are exogenous. Therefore, it is appropriate interpret OLS results.

The results for the instrumental variables regression for explorative and exploitative knowledge sharing are presented in Table 6.10. The results should be interpreted with caution as the 2SLS estimator may be biased because of the weak instrumental variables. However, the results for hypotheses 1, 2, 3a-3b and 4a-4b remain same after the instrumental 2SLS regression with some changes in coefficients and standard errors.

**Table 6.10 Results of the Instrumental Variables 2SLS Regression Analysis**

<b>Dependent Variable: Innovation</b>		
<b>First-stage regressions</b>		
	<b>Model 1 Explorative</b>	<b>Model 2 Exploitative</b>
Affiliation	-0.111 (0.110)	-0.127 (0.119)
Explorative KS X Affiliation	0.975*** (0.122)	
Exploitative KS X Affiliation		0.914*** (0.128)
Firm size	0.061* (0.034)	0.064* (0.037)
Firm age	0.001 (0.003)	-0.001 (0.004)
Industry	-0.059 (0.123)	0.035 (0.134)
R&D	-0.028 (0.063)	-0.015 (0.068)
Institutional Support	0.037 (0.076)	0.032 (0.083)
Organisational Capital	0.159 (0.097)	0.204* (0.106)
University Graduates	0.096** (0.045)	0.068 (0.049)
Turnover	-0.033 (0.043)	-0.053 (0.047)
_cons	2.159*** (0.428)	2.190*** (0.468)
<b>Instrumental variables (2SLS) regression and hypotheses testing</b>		
Explorative KS	<b>H1</b>	<b>0.659* (0.341)</b>
Exploitative KS	<b>H2</b>	<b>0.623* (0.361)</b>
Affiliation		0.145 (0.137)
Explorative KS X Affiliation	<b>H3a/H3b</b>	<b>-0.675* (0.354)</b>
Exploitative KS X Affiliation	<b>H4a/H4b</b>	<b>-0.670* (0.380)</b>
Firm size		0.060 (0.047)
Firm age		0.000 (0.004)
Industry		-0.064 (0.133)
R&D		0.202*** (0.076)
_cons		0.209 (1.082)
<b>R<sup>2</sup></b>		0.170
<b>Adj R<sup>2</sup></b>		0.119
<b>Wald chi-square</b>		20.05** (p<0.05)
<b>N</b>		121

Unstandardised regression coefficients. Standard errors in parentheses.

Legend: \* p<0.1 \*\* p<0.05 \*\*\* p<0.01. Two tailed tests.



## Appendix 6.6 Heteroscedasticity (Chapter six)

If the variance of the unobserved error is constant there is an evidence of homoscedasticity (Wooldridge 2014). Its violation is called heteroscedasticity. If the dependent variable is not symmetric there may be a problem of heteroscedasticity (Kohler and Kreuter 2012). A Breusch-Pagan test with all variables and variables that are likely to be the determinants of heteroscedasticity and a White's test are used to detect its existence (Cameron and Trivedi 2010). If the tests are significant there is a problem of heteroscedasticity. The Breusch-Pagan test results are:  $p = 0.03$  ( $p < 0.05$ ) for the full model with all variables and interactions;  $p = 0.24$  ( $p > 0.05$ ) for the independent variables and interaction terms; and  $p = 0.89$  ( $p > 0.05$ ) for the independent variables explorative and exploitative knowledge sharing. Since the full model shows heteroscedasticity problem (at 95% level) with the Breusch-Pagan results, the test is repeated to further detect the independent variable or interaction terms that may cause the heteroscedasticity problem. The results show that the interaction term between explorative knowledge sharing and affiliation has a  $p$  value of 0.04 ( $p < 0.05$ ), with a simultaneous  $p$  value of 0.24 for all independent variables and interaction terms. As a result, heteroscedasticity may be a function of the interaction term. White's test results has a  $p$  value of 0.22 ( $\chi^2(44) = 50.91$ ), ( $p > 0.05$ ) which shows no evidence of heteroscedasticity.

Stock and Watson (2015) suggest to compute both homoscedasticity-only-standard errors and heteroscedasticity-robust standard errors and compare the results. Applying more efficient estimators depends on the form of heteroscedasticity, however, regardless of the kind of heteroscedasticity, heteroscedasticity-robust standard errors can be obtained in the presence of 'heteroscedasticity of unknown form' (Wooldridge 2014). A White-corrected standard errors are calculated in order to obtain heteroscedasticity-robust standard errors (Cameron and Trivedi 2010). The results depict that the interaction variable between exploitative knowledge sharing and affiliation was significant with the usual  $t$  statistic, however, it becomes insignificant with the heteroscedasticity-robust  $t$  statistic ( $b = -0.302$ , n.s.). This result shows that whilst the interaction term between explorative knowledge sharing and affiliation is significant in the Breusch-Pagan heteroscedasticity test results, in the robust

estimation, the interaction variable between exploitative knowledge sharing and affiliation is insignificant.

However, Wooldridge (2014) argues that with small sample sizes the robust t statistic can have distributions that are not very close to the t distribution. Also, multicollinearity can cause heteroscedasticity-robust standard errors to be large. In addition, if one or more quadratic terms are omitted from a regression model or if the level model is used when a log should be used, a test for heteroscedasticity can be significant. Greene (2012) argues that without specifying the type of heteroscedasticity, the inferences can be made based on the results of least squares and in small samples White estimator may cause large t ratios. In this case, it is useful to remember that multicollinearity may cause heteroscedasticity in this study. Also, the p value of the omitted variable bias test is 0.07; this may still show some evidence of bias at 90% significance, however, it is considered as a theoretical problem. Because the sample size is small in this study, the insignificant interaction term using heteroscedasticity-robust t statistic may also be the result of the shortcomings of White estimator in small samples sizes. A comparison of coefficients, standard errors (nonrobust-robust) and t statistics are presented in Table 6.13.

**Table 6.13 Estimates with OLS Nonrobust and Robust Standard Errors for KS**

<b>Variable</b>	<b>Nonrobust</b>			<b>Robust</b>		
	<b>b</b>	<b>se</b>	<b>t</b>	<b>b</b>	<b>se</b>	<b>t</b>
Explorative KS	0.5832	0.218	2.68	0.5832	0.248	2.35
Exploitative KS	-0.2138	0.202	-1.06	-0.2138	0.245	-0.87
Affiliation	0.1063	0.133	0.80	0.1063	0.134	0.80
Explorative KS X Affiliation	-0.5682	0.298	-1.90	-0.5682	0.319	-1.78
Exploitative KS X Affiliation	0.1631	0.283	0.58	0.1631	0.332	0.49

**b:** Coefficient estimate **se:** Standard error **t:** T statistic